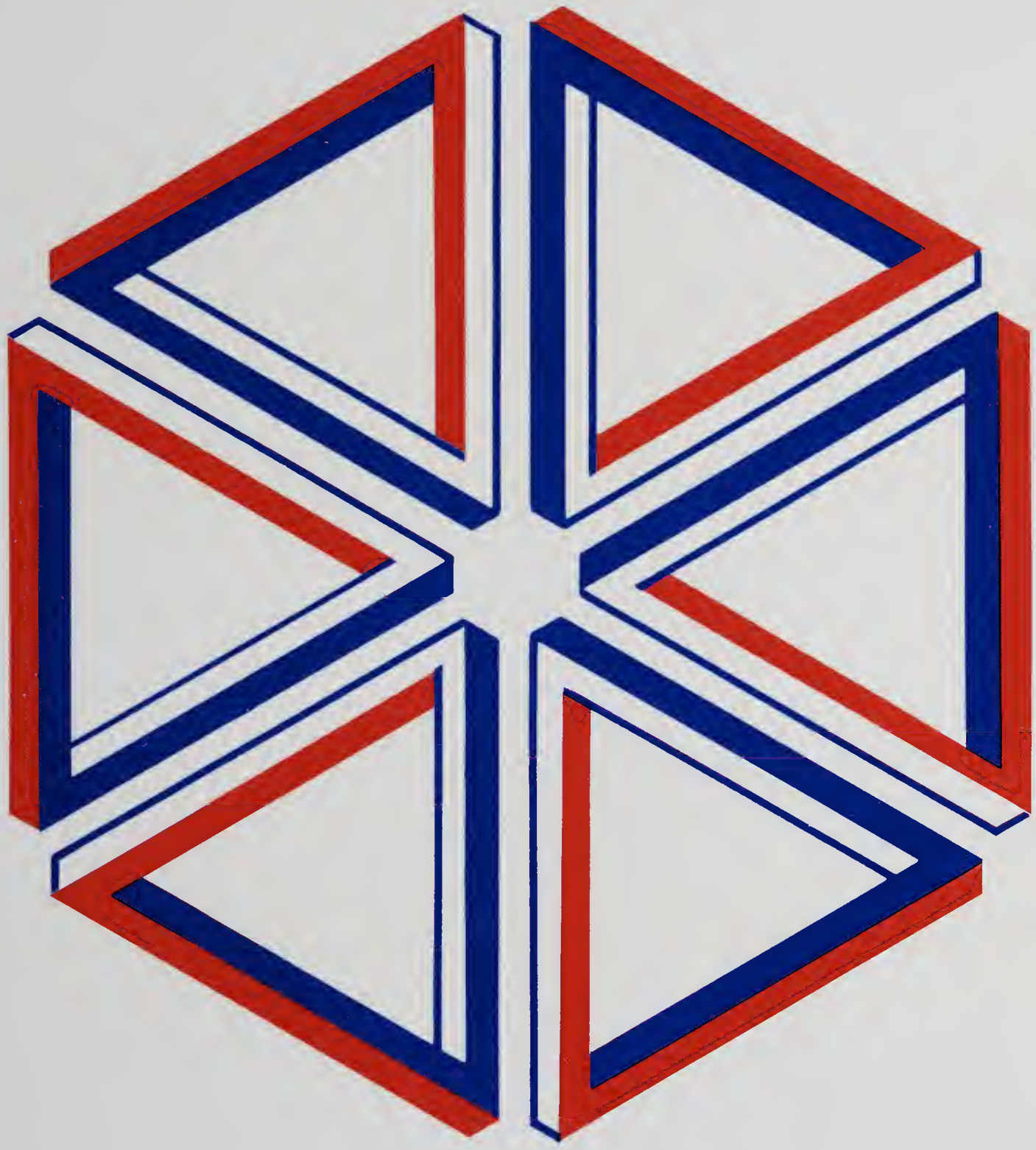
TRIALECTICS

Toward a Practical Logic of Unity



Edited by ROBERT E. HORN

Trialectics

Toward A Practical Logic Of Unity

Edited by
Robert E. Horn
The Lexington Institute

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Editor's Introduction

The Context

Needed: a new perspective

The 20th century has seen deep, fundamental changes in the way in which we view reality. Several developments have contributed to these changes. There have been profound breakthroughs since the turn of the century in the physical sciences. We face an ever more complex network of international economic, social, and environmental problems. Technological developments continue to increase the speed with which our information and problems travel around the planet.

Diverse as these developments are, they all point to the same conclusion: Our world is a unity. And the venerable tradition in the West of studying the fragments of that unity in isolation is an increasingly limited tool for understanding. We badly need perspectives which go beyond the mere acknowledgment of the unity of reality to provide effective tools for understanding that unity.

Holistic viewpoint

A long list of recent thinkers has proposed such perspectives: Buckminster Fuller speaks of "synergetics," Ludwig von Bertalanffy of "general system thinking," Norbert Wiener of "cybernetics," Lancelot Law White of "unitary thought," Gregory Bateson of the "ecology of mind," Kenneth Boulding of "ecodynamics." These authors all share a holistic viewpoint, the emergence of which is influencing how we think about ourselves, our thought processes, and the world around us.

Trialectic logic

"Trialectic logic" is Oscar Ichazo's term for that perspective. In discussing its goals, he has written, "We must arrive at a new kind of logic, a logic that explains the unity, to find the laws that explain the unity. That is trialectics." This volume is the result of the first attempt to survey systematically some of the implications and applications of Ichazo's idea of trialectic logic.

"Perennial philosophy" tradition

Ichazo's contribution to this dialogue is in some respects unique. Although he has published little over the years, he has been a prolific lecturer and a gifted teacher. In assessing his contribution, it is important at the outset to recognize his position with respect to two important intellectual traditions. His primary focus to date has been on the methodology for transforming human beings in the most profound and transcendental sense. This aspect of his work lies within the great philosophical tradition called by Aldous Huxley "the perennial philosophy," and has seen the development over the past decade of an integrated curriculum of hundreds of techniques and courses for the development of the human mind, body, emotions, and spirit.

European metaphysical tradition

On the intellectual side, however, Ichazo's scholarly lectures on history, philosophy, and logic reveal that he continues a long European tradition of metaphysical philosophy. This tradition is not well represented in the American academic philosophical community and Ichazo's occasional assumption that his audience is familiar with the works of Bacon, Hegel, Kant, Marx, and Heidegger sometimes makes his writing a challenging experience even for well-educated American readers.

Logic: Ichazo's usage

Ichazo's use of the term "logic" to describe trialectics is a case in point. His usage of this term is closely related to that of Hegel and Marx, who criticized Aristotelian formal logic as incapable of describing the change which is such a prominent part of reality. This is a frankly metaphysical usage of the term, because it assumes that the laws of logic are descriptions of "things."

Although this usage has a long history in Western thought, it is not the way in which "logic" is used by contemporary analytic philosophers in this country. Since the work of Frege and Russell around the turn of the century, and the subsequent identification of logic with mathematics, (symbolic) logic has ceased to be regarded as metaphysical. Instead, its axioms are taken to refer to *statements*, not to *things*, and to be true or false on the basis of their form, not their content. From this formal perspective, the contradiction between the unchanging nature of logical statements and the dynamic processes of nature is a non-issue, since logic says nothing about nature.

Our point is not to debate the merits of these two usages (indeed, such debate about the meaning of words is not a particularly useful activity), although Dell'Olio discusses recent trends in the American philosophical community which suggest that a more pluralistic conception of "logic" may be emerging. There are many ways to express the metaphysical points made by Ichazo (each of the papers in this volume does so in a slightly different manner), none of which should be ignored because of the dispute of two rival traditions over the usage of the word "logic."

Trialectics and the transcendental paradigm

Perhaps Ichazo's most crucial contribution, and one which makes him a major figure in the articulation of what Ken Wilber calls the new "transcendental paradigm," is his bridging of the deep gap between the wordless practice of the mystics and the practice-less words of metaphysics. Our discussions in this volume, focusing as they do on the connection of trialectics with a variety of academic disciplines, touch only one small part of Ichazo's work.

Successor to dialectics

As its name suggests, trialectic logic is seen by Ichazo as, in some senses, a refinement of and a successor to the dialectic logic of Hegel and Marx. Dialectics was an attempt to develop a philosophy to deal explicitly with change, and it did so by focusing on opposition, conflict, and contradiction within the process. Kenneth Boulding in his book *Ecodynamics* (Beverly Hills: Sage, 1981) identifies "conflict or struggle as an essential element" in the definition of dialectics. "The more conflict a process involves, the more dialectical it is." The importance of this philosophy in the world today is unquestionable. Trialectics is also a philosophy of change, but one with a radically different perspective, focusing on attraction rather than coercion, and acknowledging the unity underlying even apparently irreconcilable opposition.

Relation to recent dialectics

One hundred and fifty years have passed since the death of Hegel, and dialectics has grown and developed during that time. The definition of dialectics used by Ichazo is quite close to that found in works such as *Dialectics of Nature* by Frederick Engels (New York: International Publishers, 1940) and *An Introduction to the Logic of Marxism* by George Novack (New York: Pathfinder Press, 1971). However, the authors of the chapters in this volume recognize the existence of more subtle forms of dialectics, especially among contemporary Marxist scientists. (See the Dialectics of Biology Group, *Against Biological Determination*, and *Towards a Liberatory Biology* (London, New York: Allison and Busby, 1982) and recent issues of the journal *Science and Nature*.)These "sophisticated dialecticians" seem to have progressed well beyond the more orthodox treatments of dialectics; it is not clear to what extent they may have converged on some of the positions of trialectics.

Maruyama's call for a new logic

Other theorists have also noted the emergence of a "new logic." The anthropologist and systems theorist, Magoroh Maruyama (in a chapter called "Toward Cultural Symbiosis" in *Evolution and Consciousness: Human Systems in Transition*, edited by Eric Jantsch and Conrad H. Waddington (Reading, MA: Addison-Wesley, 1976) says, "We are in a transitional period from the 2500 year old traditional Western logic to a new logic. Such a transition in logic may be called an epistemological transition. It is more than a transition from one paradigm to another. For monopolarized persons, it is very difficult to undergo paradigmatic or epistemological transitions.

Maruyama's call for a new logic (continued)

"For them, being confronted with other ways of thinking is a traumatic experience. If they realize that there are other ways of thinking, their 'truth' is called into question and they would have to feel as if the whole universe were collapsing. Many of them react to this trauma by reinforcing their own belief and becoming extremely defensive."

Maruyama suggests an "emerging logic" exhibits these characteristics: "mutualistic, heterogenistic, symbiotic, interactionist, qualitative, relational, contextual."

Varela and the logic of self-reference

Francisco Varela, a pioneer in the investigation of the logic of whole systems, has pointed out "... I have come to the conviction that the key to understanding the wholeness of systems is to understand that they are organized, their parts are organized, in a circular form. That is, every part interacts with every other part. That gives us a totally self-referential system." This means that ordinary logics fail to adequately support reasoning about such systems. (Quotes in this section are from an interview with Varela in *CoEvolution Quarterly*, Summer 1976, 26-31.)

Varela notes that what we need next is a cybernetics of observing systems, which will go beyond the cybernetics of observed systems of the 1950s and 1960s.

Varela points out that we need to embody a logic and an epistemology that focuses on limits, particularly on the limits of our individual points of view.

And this brings Varela to a similar position to that of Ichazo. Varela points out that this understanding of our limits "leads us to a meta-understanding of humanity. If everybody would agree that their current reality is a reality,and that what we essentially share is our capacity for constructing a reality, then perhaps we could agree on a meta-agreement for computing a reality that would mean survival and dignity for everybody on the planet, rather than each group being sold on a particular way of doing things. Thus self-reference is, for me, the nerve of this logic of paradise, that is, the possibility of a common survival with dignity of humankind." A more extensive treatment of Varela's ideas appears in the *Principles of Biological Autonomy* (New York: North Holland, 1979).

History of Trialectics

First lectures

The ideas of trialectics were first presented by Oscar Ichazo in a series of lectures in 1960. Since that time, lectures have been given by Ichazo and others at the Arica Institute in New York and in Arica trainings elsewhere.

First printed source

A short discussion of trialectics will be found in Ichazo's book *The Human Process for Enlightenment and Freedom* (New York: Arica Institute, 1976). Ichazo writes, "There is a need to understand that if there is going to be unity among human beings, it will occur because we have achieved that unity by means of reason, by means of science and not by means of good will. Although good will is a strong and positive quality, it is not enough, as human history has proved ad nauseam. We must agree about our spiritual reality, and about what our psyche is."

Noted by Jantsch

The policy scientist Eric Jantsch in his book *Design for Evolution: Self Organization and Planning in the Life of Human Systems* (New York: Braziller, 1975) says, "The fragmented world of scientific disciplines is certainly of great value for the holistic mythological world of integral qualities. The dialectical approach and its generalization in the form of the systems approach . . . provides a method for elevating knowledge obtained by the rational approach for application in a mythological world. This is also the meaning of interdisciplinarity and of what . . . I shall call interexperiential inquiry. The transition from asystemic, more or less static mythological to a dynamic evolutionary world has not found a valid methodology yet; the term 'trialectics' has been tentatively proposed."

Major source

The most extensive published material on trialectics appears in Ichazo's book *Between Metaphysics and Protoanalysis* (New York: Arica Institute Press, 1982). Ichazo has for some years been working on a definitive presentation, which is expected to be published in the near future.

The First Lexington Conference on Trialectics

Impetus for conference

In the summer of 1982 several members of the group who came to this conference met to listen to a critique of Ichazo's recently published lectures.

Impetus for conference (continued)

One important realization from this meeting was that the time was ripe for a more intense and better prepared series of discussions about the meaning, implications, and applications of Ichazo's ideas of trialectics.

As a result, invitations went out for a "mini-conference" in Lexington, October 19-20, 1982.

All of the participants of this interdisciplinary group had in one way or another had previous contact with Ichazo's ideas.

To facilitate a climate of open-mindedness, frank discussion, and ruthless criticism, the conference had to be limited to between twelve and fifteen persons. As convener of the conference, I invited people from a variety of disciplines — from the humanities as well as from philosophy and the sciences.

Multiple viewpoints

At the conference many viewpoints were expressed. There were those who thought that the ideas of trialectics were "a turning point in the history of ideas" and an "unprecedented synthesis" that would have "wide influence" on a variety of fields, such as the philosophy and psychology of science, as well as immediate applications in the training of public policy makers and psychologists and lay people.

Others were far more tentative. One participant sought to demonstrate that Ichazo had not formulated trialectics with sufficient logical rigor and thus it was impossible to say more than that here were the "seeds" of something which might prove of tremendous importance.

Some topics

Among the topics of discussion and presentations were:

- What are the implications of trialectics for the philosophy of science?
- What are the connections between Ichazo's metaphysics and current physics?
- How can the three logics that Ichazo deals with be considered metastrategies for problem solving?
- What are the connections of trialectics to systems theory (cybernetics)?
- What applications does trialectics have in philosophy?

The First Lexington Conference on Trialectics, Continued

Members of conference

The members of the First Lexington Conference:

- John Bleibtreu, a natural historian and novelist, is author of *The Parable of the Beast* (New York: Macmillan, 1968).
- Hal Caswell, whose Ph.D. is in zoology, is a mathematical ecologist in the biology department of Woods Hole Oceanographic Institution and author of a forthcoming book on population biology.
- Andrew Dell'Olio is finishing his doctoral studies in philosophy at Columbia University.
- Jeannette Hargroves is an educator and a social policy researcher.
- Robert Horn is editor of the *Guide to Simulation/Games*, has taught at Harvard and Columbia, and now is president of a consulting firm.
- Sheldon R. Isenberg is associate professor in the Department of Religion of the University of Florida, Gainesville.
- David Johnson is a Fellow of the Lexington Institute, and was formerly economics librarian for the New York Public Library.
- Sheila Laffey, a film maker and film critic, is an assistant professor of cinema studies, School of Communications, Ithaca College and recently completed directing the film, *Walden*.
- Michael Lebeck is a translator, the author of two books of verse, and a Fellow of the Lexington Institute.
- Burton Voorhees, whose Ph.D. is in physics, was formerly with the Center for Advanced Study in Theoretical Psychology at the University of Alberta, and is now in the Department of Mathematics, Athabasca University.
- Wyatt Woodsmall, whose doctorate at Columbia is in the philosophy of science, now works for the Federal government.

Other members

Other members of the group, who have attended subsequent Lexington Conferences are:

- Patricia D'Andrade is a Fellow of the Lexington Institute and an editor.
- Stephan Chodorov, whose J.D.is from Yale, has spent the past 15 years making documentary films.
- Joseph Rosenshein, whose Ph.D. is in physics, is director of pre-professional education at the University of Florida.

Format of conference

A few papers or drafts of papers were circulated before the conference. They represented a launching platform for the discussions. There were two or three formal presentations, but for the most part, the conference discussion was free-flowing.

A portion of the group met again in early January, 1983 for a one-day follow-up which resulted in one of the papers (Caswell's "An Injunctive Form of the Axioms of Trialectics"). A third meeting in May, 1983 produced several more papers, including the one by D'Andrade and Johnson reproduced here.

The papers collected in this volume were extensively rewritten as a result of discussion at the conference and afterwards.

The requirements for preparing a volume of manageable length made it necessary to shorten many of the papers, much to our regret. For the same reason not all of the presentations and discussion drafts have been included.

We wanted to produce a volume that:

- could stand alone and provide an overview of trialectics, thus making it available to the widest possible audience
- convey the spirit and flavor of the conference
- begin the task of applying the concepts of trialectics to appropriate areas.

Plans for future

As this volume goes to press, various members of the group are considering these questions:

- How can trialectics contribute to the analysis of social policies?
- How does one evaluate the status of metaphysical research programs such as trialectics?
- What are the epistemological implications of trialectics?
- What are the connections of trialectics to Whitehead's process philosophy?
- How does Ichazo's metaphysics relate to some of the "holistic" paradigms as expressed by Capra, Bohm, and Sheldrake?
- What are the specific procedures for doing trialectic analysis, especially with complex processes?
- What is the relationship between trialectics and current developments in such areas of research as dissipative structures, catastrophe theory, bifurcation theory, and autopoesis?

Acknowledgments

Appreciations My friend, Ted Melnechuk, who is widely known as the convener of conferences on "hot topics" in the neurosciences, originally suggested this collection. To him we send our thanks for getting this process started.

In the editing of the proceedings I was assisted by Hal Caswell, Patricia D'Andrade, David Johnson, Michael Lebeck, and Burt Voorhees. I want to express my appreciation to them for their invaluable help. Sharon Elkins, Susan Osgood, and Joan Peterson have our thanks for their invaluable help with the many drafts of this manuscript.

The whole group joins me in thanking Jeannette Hargroves for finding and working with the caterer for the Lexington Conferences, Constance Brown, who satisfied our gastronomic needs.

And last of all, all of us involved in this project want to express our appreciation and thanks to Oscar Ichazo.

A Note on the Organization of this Volume

Content The editor has arranged these papers so as to lead the interested reader easily into the field of trialectics. More general, introductory treatments precede more technical and specialized chapters.

Chapter 1 is intended as a general overview of the territory of trialectics. Its examples are drawn from two fields readily accessible to most readers: the psychology of everyday life and public policy.

Chapter 2 presents Caswell's formulation of the axioms of trialectics in a form which allows them to serve as guidelines for scientific research.

Chapter 3 presents Voorhees' use of trialectic point of view to illuminate the history of science and theories of theory construction.

Chapter 4 gives a detailed analysis by D'Andrade and Johnson of the differences between the views of traditional and contemporary dialecticians and the trialectic point of view.

Chapter 5 contains Dell'Olio's presentation of the current state of academic philosophy and how its issues relate to those discussed in trialectics.

A Note On the Organization of this Volume, Continued

Content (continued)

Chapter 6 ventures into more technical realms as Dell'Olio examines the various meanings of "formal logic" in an attempt to reconcile the usage of this word in trialectics with its meanings in analytic philosophy.

Chapter 7 is also more technical. Here Caswell presents an overview of contemporary general systems theory in order to demonstrate the convergence of metaphysical trialectics with the workaday cybernetics of the practicing scientist.

The Information Mapping method

The organization and format of this volume depart from usual presentations. We have chosen to use the methodology of Information Mapping®, a set of techniques developed by the editor of this volume. Information Mapping is designed to make retrieval of information from documents easier and quicker.

In this system, major "chunks" of material are delineated by horizontal lines and identified by marginal labels.

How to read

We suggest that on your first time through, you ignore the marginal labels — they are there to help you reference material later.

Some readers, however, will find that using the labels on first reading helps them get a better picture of the organization of the papers.

Robert E. Horn
Lexington, Massachusetts
April 30, 1983

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Chapter 1
An Overview of Trialectics With Applications to Psychology and Public Policy

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Points of View

Definition: points of view

Points of view are the underlying assumptions, deeply held, often unexamined, which form a framework within which reasoning takes place.

Points of view determine to some degree how and what we perceive in the outside world, our models of the world, and how we think about ourselves. Points of view also determine how we think about other points of view.

In recognition of the way in which characteristic points of view determine our reasoning, Oscar Ichazo (1976, 1982) calls them "logics." He suggests that such points of view are the basis for rationality and the underpinning of different theories. Point of view is regarded as fundamental because it determines any thinking we do. In particular, the assumptions we hold regarding the nature of identity (What is something?) and the nature of change (How does something become something else?) influence our reasoning decisively.

Relativistic points of view

The evolution of human thought presents us with a vast panorama of points of view. But only recently have we begun to see individuals consciously holding and using several points of view for different purposes.

The 20th century has seen an accelerated examination and critique of points of view. There have been huge revolutions in how humanity views itself, especially in our intensive examination of language, cognition, developmental psychology, neurophysiology, and philosophy. Our century has witnessed the invention of the idea of relativity, the notion of paradigms in science, the idea of the "social construction of reality" in sociology, and the development of metapsychology and a large group of other "metas." A "metadiscipline" is an analysis of the assumptions and ways of reasoning of the discipline to which it is meta.

At first we had only metaphysics. Now we have meta-almost-everything: metapsychology, metascience, metaprogramming, metalinguistics, metatheory, and metastrategy, to name only a few.

Common theme: using points of view

What is common to all of these ideas is that they represent a revolution in point of view. Central to this revolution is much more than the awareness that different disciplines study phenomena differently. What is novel is that instead of "having" a point of view, many people talk now about how they are able to "use" points of view for particular purposes, holding them almost as tools, useful for the present but not to be confused with a comprehensive or universal viewpoint, since there are limits to every point of view.

Result: ability to see unity

As a result of evaluating points of view as to their usefulness or lack of it, more and more people are able to look at the world from each other's perspectives. Many claim to be able to see a unity underlying these viewpoints.

Result: close examination of viewpoints

This preoccupation with points of view has resulted in an intensive examination of the viewpoints themselves:

- If people can adopt points of view temporarily for particular purposes, how do they go about doing that?
- What are properties of and laws for entertaining a variety of points of view?
- How does one identify an unconscious point of view?
- Are we able to communicate without a point of view?
- Are there levels of points of view?
- What can we find out about meta-points-of-view?
- How can we train ourselves to use other points of view?

Result: flexibility

Another important result of recognizing points of view as useful or counterproductive is increased flexibility. There is a growing awareness across the intellectual community that the capability of adopting points of view temporarily (even those with which you disagree) is in itself not only an important skill but perhaps a new level in the ongoing evolution of humanity's untangling of its various points of view.

There are now people who believe that the ability to study and deal with different points of view is critical to our ultimate ability to agree (that is, to find unity or make unity) and perhaps to survive as a planet and a species.

Three Points of View

Ichazo's three viewpoints

Oscar Ichazo (1976, 1982) has presented a basic analysis which clarifies our thinking about the nature of change and identity. He asserts that the evolution of human thought presents us with three fundamental logics or points of view. The first two he associates with the names of philosophical positions: formal logic, first formulated by Aristotle, and dialectics, formulated by Hegel and later purged of its philosophical idealism by Marx and Engels.

This usage is neither arbitrary nor a denigration of these original thinkers. European culture functioned for two millennia with the ideas formulated by Aristotle. The dialectics of Hegel is the culmination of the thinking of Bacon and Descartes upon which Western science of the last few centuries is grounded.

But there are areas in which neither points of view nor their enculturation as logics can be said to produce uniformly beneficial results — as the history of Western culture demonstrates.

What is the *legitimate* use of a point of view and its associated logic? If you find that they solve a problem without creating more problems, then you have chosen well. As Ichazo pointed out (1976), reason is mankind's chief "tool of survival." However, if you do not learn how to think in conformity with reality your thoughts will use *you*. There is nothing wrong with formal logic except being controlled by formal logic. There is nothing wrong with dialectics except being in the grip of dialectics.

A third, more inclusive point of view has become a necessity. Such a point of view has been emerging recently under a variety of names. It is described as a holistic point of view that comprehends more of the different ways we view the world in individual scientific and philosophical disciplines.

Similar points of view

This emerging point of view has been called: "ecology of mind" (Bateson 1972), "unitary thought" (Whyte 1974), "general systems thinking" (von Bertalanffy 1968), "cybernetics" (Wiener 1948), "synergetics" (Fuller 1975), "ecodynamics" (Boulding 1981) among many others. Ichazo calls his formulation of this point of view "trialectics." It would be a mistake to equate all holistic world views. Trialectics is one of many holistic perspectives that focuses specifically on questions of identity and change.

Goal and organization of this chapter

The goal of this paper is to present a brief introduction to Ichazo's thinking on these three points of view and in particular to present an informal overview of its potential application to psychology and public policy.

I have organized the paper into main sections dealing with each of these three points of view:

1. Formal logic
2. Dialectics
3. Trialectics

Within each of these sections I will give a brief outline of the axioms Ichazo associates with these points of view. I will also present examples from dynamic psychology and public policy issues which illustrate the advantages and major limitations of each of the types of human thinking.

I will avoid, insofar as possible, dealing with the multifold historical and metaphysical aspects of each of the points of view discussed.

Rather, I want to focus on how these points of view affect important human activities and how they operate in everyday life.

TABLE 1: AXIOMS OF THE FORMAL LOGIC, DIALECTIC, AND TRIALECTIC POINT OF VIEW

POINT OF VIEW	AXIOM
FORMAL LOGIC	1. The axiom of identity (A is A).
	2. The axiom of contradiction (A is not not-A).
	3. The axiom of the excluded middle (A is not both A and not-A).
DIALECTICS	1. The axiom of transformation: Sufficient changes in quantity may produce changes in quality.
	2. The axiom of interaction between opposites: Opposing forces produce a transformation of the system which includes both of them.
	3. The axiom of negation of the negation: The thesis overcomes its antithesis to produce something different from either of them, the synthesis.
TRIALECTICS	1. The axiom of mutation: There is a mutation from one Material Manifestation Point (MMP) into another MMP.
	2. The axiom of circulation: Inside of everything is the seed of its apparent opposite.
	3. The axiom of attraction: Process occurs in accordance with the attraction of MMPs at different levels.

Source: Ichazo (1976, 1982)

Part 1
The Formal Logic Point of View

The Axioms of the Formal Logic Point of View

Formal logic basis for thought about identity and change

This section reviews briefly the three traditional axioms of formal logic, their characteristics, and some of their implications.

These axioms, sometimes called "laws of thought," are actually attempts to supply, in articulated form, the necessary underpinnings for reasoning, with particular reference to the nature of identity and change. What Ichazo calls formal logic is not the same as formal logic currently taught in college courses by that name, in which logic is presented as a set of procedures for correct reasoning.

Rather than symbolic logic (which has carefully defined its narrow but vital field of competence), Ichazo means by "logic" the traditional laws of thought as formulated by Aristotle and refined by the medieval schoolmen. But more than the contents of any book or course, it is a habitual mode of perception and behavior which Ichazo has in mind. See Dell'Olio's (1983) paper, chapter 6 in this volume, for a more detailed examination of the relationship of formal logic and Ichazo's thought.

The axioms of formal logic

Underlying this type of thought and behavior Ichazo identifies three axioms. Of course a person "operating in formal formal logic" is not aware of these axioms. All the same, he can be seen as their slave. "Operating in formal logic" is thus totally different from "making use of symbolic logic." "Operating in formal logic" means being manipulated by unexamined concepts, responding mechanically. The principles determining this mechanical behavior, mental, emotional, and physical, Ichazo defines in the following axioms:

The axiom of identity. A thing is always equal to or identical to itself; everything is what it is. (A is A)

The axiom of contradiction. A thing can not be both itself and something else. (A is not not-A)

The axiom of the excluded middle. Each thing must be one of two mutually exclusive things. (A is not both A and not-A)

The Axioms of the Formal Logic Point of View, Continued

Implications of the axioms

While a person who fails to make the proper and necessary application of formal logic in perceiving identities — beginning with his own self-identity — will be adjudged insane, the axioms of formal logic are often misapplied in everyday life. For instance, the implication of these axioms is that something can never change into something else. We have all heard people talk that way. A leopard can't change its spots, goes the saying. You can't teach an old dog new tricks. Sometimes we mistakenly apply this type of thinking to our personal lives and to public policy.

Examples: personal

Here are some glaring examples of this type of rigid, stereotyped thought from the personal realm:

You either love me or you don't. You can't love me and look at other men (women) at the same time. My love for you will never change.

Examples: public policy

Examples of the misapplication of formal logic thinking also abound in the public policy realm:

Once a conservative, always a conservative. Liberals are liberals. You are either for us or against us. As long as they are Communist, you can't expect them to be different. The Russians will always be expansionistic. The Americans will always be imperialistic. You cannot be a friend of that country and a friend of our country at the same time.

All of these examples have a common theme: the notion that in human affairs things cannot change. We will take up the severe consequences of not considering time and change in the next section.

Major Limitations of the Formal Logic Point of View

No consideration of time and change

The basic limitation of the formal logic point of view is that there is no convenient and consistent way to consider time and change within that point of view, as Korzybski (1958) and Hayakawa (1972), among many others, have pointed out. The fundamental belief which determines this type of thinking is that things do not change.

Major Limitations of the Formal Logic Point of View, Continued

No consideration of time and change (continued)

The erroneous application of the formal logic point of view leads to the assumptions: I am what I am. You are what you are. We will never be anything else.

Time is ignored. We deal with only the truth of the generalized, conceptual abstraction. The feeling-implication of the axiom of identity is "forever and always." Once a thief, always a thief, says folklore.

This world view is static. However, we cannot fail to acknowledge the dynamic nature of reality. People have probably perceived change for a great many millennia longer than they have used and abused formal logic. However, until Hegel dealt with change, change was "irrational." It operated "outside logic." Some ancient philosophers refused to consider "becoming." There was little or no science, only isolated techniques.

Science arose as Aristotelian logic was breaking down. A major goal for science is to account for change. Yet even we scientists sometimes operate in our labs, classrooms, seminars, offices, and homes according to the formal logic point of view. And we generate our dilemmas of reifications and reductionism out of the unconscious use of this point of view.

Examples: public policy

Examples of this pseudo-permanence may be found easily in public policy. Programs created to handle an emergency take on a life of their own and almost immediately are thought of as a permanent part of the political scene.

Stereotyping of minorities results from the specious generalization which the formal logic point of view lends itself to so easily.

Language habits determine point of view

Peculiar things happen when we unwittingly apply the formal logic point of view to ourselves and other people. It leads to people viewing themselves in highly structured roles in which they have little sense of their possibilities outside the characteristics they use to define themselves. Our language habits often seem to draw us into formal logic thinking even when we are trying to avoid it.

Major Limitations of the Formal Logic Point of View, Continued

Examples: only see objects

We tend to see the world as a collection of objects connected by causes. When I am in a formal logic point of view, I tend to see myself as one such object. I unconsciously assume, "I will always be how I am now. I may change a little but basically I'll always be the same."

The alternative is to use this point of view only when it is useful, but to remember, as Buckminster Fuller (1972) says, that objects "on closer inspection are themselves mass-attractively integrated energy event aggregates, each of which is so closely amassed as to be superficially deceptive and therefore misidentified by humanity's optically limited discernment, as bodies — separate solid bodies — despite that physics has never found any solid phenomena."

Examples: blame and guilt

Persons operating from the unexamined formal logic point of view are prone to blame a lot or feel guilty (i.e., blame themselves). They see the world in right and wrong, good and bad, black and white. "Guilty" parties in divorces are an expression of this position: "If it weren't for you, I wouldn't be in the mess I'm in."

Examples: prejudice

At the bottom of prejudice lies a generalization about "a class of people," a notion which depends, rightly or wrongly, on the exercise of formal logic. Liberals are lazy, woolly-headed utopians. Conservatives are heartless, profit-making exploiters. Men are assertive. Women are passive.

Examples: reductionist psychology

The misuse of formal logic thinking tends to the overvaluation of trait psychology, IQ tests, and to the development of highly mechanistic, alienated self-views. It leads to a definition of self that ends with my skin. This type of definition follows from the definition of the environment as that which is "outside of" me — i.e., the environment is defined using the axiom of contradiction. It implies that I am not (really) part of my environment. This being the case, I don't hurt myself if I damage it.

Part 2
The Dialectical Point of View

The Axioms of the Dialectical Point of View

Dialectics as a point of view

Since its inception by Fichte and Hegel, dialectics has led a strange life. Pruned of its idealism by Marx and Engels, it has become the secular religion of Eastern Europe, the USSR, and China. As Ichazo (1982) demonstrates, its assumptions have been the unacknowledged philosophy of American and European capitalism as well.

In this paper I shall take the position that, as a collection of assumptions that influences how we see the world, the dialectics point of view influences to some degree the thought of most people.

Definition: dialectics

Dialectics as a point of view can be defined as that behavioral system that sees or interprets change in terms of increases or decreases of quantity, sees change as inevitably and solely arising out of conflict, and sees this process as continuous and without limits.

We should note here that over the centuries the term dialectics has been defined and used in widely divergent ways. The definition used in this paper follows that of Novack (1971) and Boulding (1981) and should not be taken as a summary of the large literature on the subject. For a more detailed discussion of dialectical thinking, see D'Andrade and Johnson's (1983) paper in this volume.

Axiom of quantity and quality

The dialectical point of view can be organized most conveniently around three axioms.

Classically, the first axiom of dialectics is called the axiom of quantity and quality. It says: Quantitative change produces qualitative change.

Examples: public policy and psychology

Some examples of the naive use of this type of thinking in public policy are such statements as: If we continue to increase the quantity of consumer goods, we will improve the quality of life for everybody. If we increase our military spending, we will be more secure. If we increase the portion of the national budget devoted to basic science, we will get better basic science.

In personal psychology, a statement such as "If I just try harder to decrease the amount of time the awful parts of my personality come out, I will be more attractive to men/women" is an example of trying to change quantity to affect quality.

The Axioms of the Dialectical Point of View, Continued

Axiom of interaction of opposites

The second axiom of dialectics, the axiom of interaction of opposites, states: Change results from the inevitable contradiction (i.e., conflict or struggle) between opposing forces.

Examples: public policy

Some notions justified by the axiom of interaction of opposites are: There is an inevitable conflict between capitalism and communism, between workers and bosses, tenants and landlords, administrators and professors, etc., and this inevitable conflict leads to change.

The psychological implication of this axiom is that there has to be an antagonism, a fight, a conflict to produce change. This is the basis of the explanation of change in dialectics. If we add more force, we will get change that will arise out of the conflict of the two sides.

Axiom of the negation of the negation

The third axiom of dialectics is called the axiom of the negation of the negation. It states: Any thesis inevitably leads to an antithesis (or opposite) and the conflict between the two produces something different from either, the synthesis (or result).

Ths axiom got its awkward name from the notion that inevitably the antithesis negates the thesis and in turn is inevitably negated by the synthesis. The idea is that all processes seem to "negate" or "deny" themselves.

Examples: public policy

Some examples of policies that have led to their reverse are: The force of the labor movement in conflict with management of the large corporations in the U.S. resulted in the setting up of pension funds, which subsequently invested in stock. This has produced a situation where labor pension funds, by investing in company stock, will soon own a majority of the stock of the major corporations, thus reversing ownership patterns, something which neither antagonist foresaw (Drucker 1976). The conflict of World War II produced new alignments in the world: Friends became enemies and vice versa.

Major Benefits of the Dialectical Point of View

Incorporates opposites and change

Dialectics has considerable advantages over formal logic as a position from which to view the world because it invites a person to consider the nature of opposites (contradiction, polarities, antagonists) and to anticipate change in processes.

The dialectical point of view incorporates the common human experience that conflict frequently results in change. We know that when we have a fight with a loved one there is frequently a change in the relationship, perhaps leading to clarification.

The dialectical point of view thus gives a major role to the universal human experience of opposites: pain and pleasure, hunger and satiation, heat and cold, etc.

Historical note

Historically, the dialectical point of view became articulated in philosophy in the age of the industrial revolution and mass production. It accompanied (facilitated, reflected) the major social reorganizations of the 18th-20th centuries, including the rise of the nation state, mass armies, world wars, multi-national organizations and companies, doomsday machines, unlimited pollution threatening the planet. It permitted human beings to go to the moon. (If we apply enough national effort to a goal, we can overcome even gravity itself.)

Dialectics present in capitalism and communism

Many Americans associate the notions of dialectics with the dialectical materialism of communism or socialism. As Ichazo has pointed out in one of his lectures, however:

"The best dialectical minds are in Wall Street. The whole conception of dialectics is the principle of contradiction. Contradiction is the principle used in dialectics to produce motion. In Wall Street there is the notion of 'I can make a better one.' Competition results in a more dynamic society. The U.S.A. is the highest product of dialectics and the dialectical mind." The creative dynamism developed by team work *and* competition can produce outstanding accomplishments.

Value of dialectics

The lasting value of dialectics and what makes it absolutely essential as a component of our minds is its ability to utilize opposition and conflict to produce change. No amount of formal logic can do this. "A is not not-A" does not tell us and cannot tell us that A is the opposite of B. Even while the broader point of view of trialectics, as we shall see in a later section, shows us that all opposition and contradiction is only *apparent*, we need the dialectical point of view to identify apparent contraries.

Major Deficiencies of the Dialectical Point of View

Lack of limits

But the dialectical point of view has its deficiencies. There is an absence of the recognition of limits in dialectics. That unlimited growth for *my* family/company/nation is good, is perhaps the most prominent dialectical position in the world today.

Example: nuclear weapons

One example of the deficiency of dialectical thinking is the dilemma of nuclear weapons. Clearly, the nuclear powers have reached the limits of their ability to increase their power; they cannot produce more national security within the framework of their current assumptions.

Examples: social programs

The deficiencies of applying dialectical thinking to social programs has also revealed itself. A breakthrough (note how the dialectical metaphor of forcing permeates our language) in point of view is needed. The limits of growth model of the Club of Rome report (Meadows et al. 1972) focuses our attention on such limits. Attempts to use naive dialectical thought during the Great Society days to "solve" social problems has now produced disillusionment with the ability of the Federal government to solve problems. The notion of "more is better" or "throw money at the problem" often does not solve the problem. In many cases it can only make it worse.

Garrett Hardin (1972) has pointed out other social thinking that suffers from the deficiencies of the dialectical point of view. He points to effects such as "building skyscrapers because of the high price of land, which drives the price of land even higher; building faster, noisier aircraft that must have airports farther from the city which in the end makes door to door travel between Boston and New York no faster by plane than by train, car or bus."

Example: limits to the planet

The assumption of dialectics is that there are no limits to any process. That this fundamental assumption remains unexamined leads to inconsistent behavior. For example, although most educated people know better, they still operate on the dialectical assumption of limitless natural resources. The possibilities for economic development are endless. Dialectical thinking has given us the disposable planet.

Conflict as prime mover

The second major difficulty with dialectics in its classical expression is the notion of conflict as the generator of change. The metaphor lends itself to justification of struggle, violence, and constant fights. In fact when we investigate carefully, we see that there is less reason to consider conflict as the key idea in change. More will be said of this later in the discussion of trialectics.

Limitations of Dialectics in Psychology of Self

Examples: more is better

These same deficiencies appear when the dialectical point of view is applied to the psychology of the self. Lovers who hold a dialectical point of view will reason that, because loving contact feels good, more would be better, and best of all would be if "we could be together all of the time." They then reason, "Because we see some things in the same way, we should see all things the same way."

A dialectical point of view tends to make a person think, "I can do it better than you can. Things can be better, can be improved, if we only try." (That is, work hard enough at it or put enough pressure on the other guys.) Such people are continually trying to apply "just a little bit more . . . then just the extra amount . . ."

Examples: conflict and struggle

In expressing the dialectical point of view, a person's speech and thought is loaded with force metaphors: overcoming obstacles, forcing the solution, breakthroughs in research, threat and veiled threats.

As a result of this pushy force-oriented language, dialectical persons frequently create opposition and resistance for their ideas, thus producing obstacles for the very things they wish to accomplish.

Example: force "reality" on others

When there are differences between two people, each person thinks that he or she sees it as it "really is." No matter how many times they find out that human understanding is partial, limited, and prone to error, persons in the grips of the dialectic point of view will, nevertheless, attempt to force their "reality" on others.

Part 3
The Trialectic Point of View

Introduction

Trialectics encompasses formal logic and dialectics

Ichazo's third point of view resembles some of the emerging "holistic" paradigms in the philosophy of science.

In designating this point of view "trialectics," Ichazo contrasts a number of its features with the dialectic point of view.

One might say that a trialectic point of view encompasses dialectic and formal logic points of view.

Trialectics admits that the formal logic point of view is necessary for using language consistently, but sees the important limits formal logic concepts tend to place on us.

Trialectics subsumes dialectics by acknowledging that increases in quantity do, indeed, produce changes in quality in some situations, but that is not the only or even dominant form of change. The dialectical point of view is necessary to identify apparent temporary opposites or contradictions, but it is unable to tell us how to deal with such appearances in a fruitful way.

Organization of this section

There are many ways of describing the trialectic point of view. Ichazo, for example, presents a set of axioms and corollaries. These are presented in Table 2 on the following page.

I will organize Part 3 of this paper as a commentary on these axioms and corollaries. In my discussion I will continue to use illustrations drawn from psychology and public policy. Ichazo (1982) clearly means to have this viewpoint integrated with his cosmology, metaphysics, and epistemology. Because others are better qualified to deal with these issues, I will only occasionally and briefly note such linkages. At the end of the section I will present some suggestions for applications of this point of view to practical problems.

TABLE 2: THE AXIOMS AND COROLLARIES OF TRIALECTICS

Axiom of mutation

Ichazo (1976, 1982) lists the following as the axioms and corollaries of trialectics:

1. There is a mutation from one material manifestation point (MMP) to another material manifestation point.
   a. The mutation is completed when internal equilibrium has been achieved.
   b. MMPs are neutral points of energy retention.
   c. Energy moves in a universe with pre-established laws and pre-established MMPs or within pre-established patterns.

Axiom of circulation

2. Inside of everything there is the seed of its apparent opposite. The equilibrium between opposites depends on a balanced circulation of energy.
   a. From the cosmic point of view, opposites do not exist.
   b. From the cosmic point of view, there are no random accidents, only a process of circulation.
   c. In nature there are no accidents.

Axiom of attraction

3. The perpetual motion of all creation is due to the interchange of energy between MMPs and there is, therefore, an inherent attraction to either a higher or lower MMP.
   a. Higher MMPs are regulated by a smaller number of factors and elements.
   b. MMPs are responsive to the attraction of higher or lower correlating vibrations in a pre-established pattern.
   c. One MMP's attraction to another can be ascending or descending.

Source

Ichazo has stated these axioms (he frequently calls them "laws") slightly differently over the years. This list has been adapted from Ichazo (1976, 1982) and recent lectures. Appendix A gives Ichazo's 1976 version of the axioms which are sometimes quoted in the following sections. See also Caswell's (1983b) chapter on an injunctive form of the axioms in this volume.

Process is Fundamental

First axiom: mutation

There is a mutation from one material manifestation point (MMP) to another material manifestation point (MMP).

Process: central metaphor

The nature of process or change is the central focus of the trialectic point of view. Ichazo clearly distinguishes it from the static timelessness of formal logic and the conflict-contradiction metaphor of the dialectical point of view.

This emphasis on process is decidedly in the air; witness David Bohm (1970), who states in a context of the discussion of theoretical biology, "The basic metaphysics that I am now considering is one in which process is fundamental. I therefore suggest that one entertains the notion 'All is process.' That is to say, 'There is no thing in the universe.' Things, objects, entities, are abstractions of what is relatively constant from a process of movement and transformation . . . Rocks, trees, people, electrons, atoms, planets, galaxies, are . . . to be taken as the names of centers or foci of vast processes, extending ultimately over the whole universe. Each such center of focus refers to some aspects of the overall or total process . . ."

The Material Manifestation Point (MMP)

MMP: a new concept

Instead of saying "All is change," generalizing as Heraclitus did, Ichazo gives a name to what changes: "material manifestation point" (MMP). In one sense, all this axiom does is point to change as "one of the most conspicuous and most pervasive features of our sensory and introspective experience . . ." (Capek 1967). But a great deal of the trialectic point of view is in the term MMP.

Definition: MMP

The material manifestation point (MMP) can be defined as any identifiable state of a system at a given time. What thinking does is to isolate these MMPs and the relevant aspects of their environment for analysis.

Thus the term MMP carries within it the Einsteinian truism of modern physics that energy and matter are convertible into each other. MMP also carries the connotation that in the universe as we know it, energy-matter is a unitary "substance", i.e., that energy-events change slowly (to human eyes).

The Material Manifestation Point (MMP), Continued

Definition: MMP (continued)

The concept of the MMP covers what we conveniently call material objects, as well as ideas, events, and meaningful collections, but with the added connotation of "objects-plus-interrelationships-with-the-rest-of-the-world-and-as-energy-manifesting." Basic to the notion of an MMP is that it is energy manifesting.

The notion of "manifestation" connotes a temporariness, a current part of the flow that is in a stable state and that will transform into another manifestation.

A spectrum of manifestation

Energy, matter, events, and information compose a spectrum of manifestation. Identifying a spectrum of manifestation raises the question of what it is that is manifesting. It is "something" which cannot be defined. In Indian philosophy it has been called *sunyata*, frequently translated "void," which comprehends both manifestation and unmanifestation. Ichazo (1976) calls the underlying substance "consciousness."

One should note that Ichazo uses the word consciousness for more than the notion of "point of awareness" or as the opposite of asleep.

MMPs depend on definition

Trialectics states that you and I are MMPs at a particular level of consciousness and at this place in the evolution of the planet and connected to all other people in our species and connected to the environment of our planet and our galaxy.

Objects, people, places at a specific time-space (point or duration) are examples of MMPs. Having these particular thoughts at this moment in space-time (in my nervous system) is an MMP.

MMPs are higher or lower

Another feature of MMPs is brought out in the third axiom, the axiom of attraction, which will be taken up in more detail later. MMPs are hierarchically ordered; there are higher and lower MMPs. In assigning the values "higher" and "lower" to MMPs, there is no more *moral* judgment than in assigning these adjectives to life forms. Primates are higher (more complex in organization and behavior) than plankton. No one claims that they are better or more useful.

A higher MMP is subject to fewer constraints than a lower one. A well integrated person, for example, has more choices than a person who is subject to compulsions, or one who is programmed by his unexamined experience, or one who is manipulated by advertising. Theirs are dull, stunted, painful existences. The desire to be free rather than controlled is "an attraction to a higher MMP." It does not depend on a moral judgment either but rather on the innate human drive to avoid pain and seek well-being.

The Material Manifestation Point (MMP), Continued

Differences: pressure or attraction

Ichazo's first law (mutation) can be contrasted with the dialectical axiom, "Changes in quantity produce changes in quality." The dialectical point of view thus sees problem solving as the application of a sufficient quantity of positive or negative pressure to the problem (e.g., bribe them or threaten them). A trialectical viewpoint would examine both sides to find a means to achieve greater unification.

Trialectics, by counseling the identification of existing limits, corrects the endless desires fostered by the dialectical point of view.

Example: personal exercise

For a brief exercise in seeing how this can affect personal life and policy analysis, try this exercise: Use the words "everything changes" to remember this idea silently every time you say a sentence (everything changes). The problem, says the foreign minister, is that the Arabs are charging too much for their oil (everything changes). You and I are feeling intense love for each other (everything changes). I feel like I'll never really succeed (everything changes).

From a personal point of view, reminding ourselves that the momentary difficulty or problem is not fixed, will not last forever, will change, is a tremendous advantage over the formal logic point of view.

Some goals of trialectics

Ichazo's principal goal in developing trialectics is to enable us in our everyday lives to be more sensitive to the way we deal with concepts of identity and change, to how we "see" them and how we talk about them. His process point of view increases our ability to operate with greater flexibility in a constantly changing universe.

Ichazo has designed trainings based on these ideas, which enable a person to more easily operate within the framework of this point of view.

Difficulties with the Concept of Process

Language divides, nominalizes, obscures

Mutation, change, transition, movement, transformation, process, operations are all words for the same concept. This concept is among the most complex to describe and analyze or put into metaphors. The history of Western science is the history of the progress that humanity has made in understanding more and more about the laws and patterns of process, particularly on a physical, chemical, and biological level.

Language divides, nominalizes, obscures (continued)

However, the processes and transitions within ourselves — the province of psychology — are often distorted by our tendency to conceptualize, analyze, and describe these processes as static. It is obvious to us that everything changes, but we try to protect ourselves from personal change by more or less permanent conceptions of "how we are" and "how it has to be."

An obvious problem in our attempt to look at change is the way our language separates the process into artificial parts and then nominalizes parts of the process (i.e., makes a string of nouns out of swiftly changing processes).

Consider the sentence: "We're getting along better now," spoken about a couple. This is a very reduced and abstract way of describing the last few months of their lives. To turn this description into a string of nouns (arguing, anger, anguish, withdrawal, resentment, frustration, recognition, self-examination, commitment, confrontation, sharing) is already quite a bit more revealing, which is to say it contains more information.

All the same, there is no way a string of nouns or a string of sentences or even a string of chapters could equal or be a few months of a lived life. Not even if you took six months to read through it.

The abstraction and description of process are important for communication. But they do not reproduce life or the process.

Any described process is history

Process never stops, so once an event happens, it is suddenly gone. We are always using words to catch the past. No analysis is ever about the present; every analysis is always about the past.

Example: personal exercise

If we try to describe what is happening to us in the present moment we see how difficult it is. Try the exercise of saying "Right now I am . . ." followed by whatever you are aware of — "Right now I am aware of the seat under me . . . right now I am aware of writing . . . right now I am aware that I am thinking about what to write . . ." And I notice that my recent "right nows" are already fading into history.

Processes difficult to see

Another difficulty is that many large processes can only be inferred. For instance, we cannot see the earth going around the sun. To "see a process" we must be particularly alert to draw the boundaries around the most significant relationships; otherwise, we will misperceive.

Difficulties with the Concept of Process, Continued

Processes difficult to see (continued)

Some processes are exceedingly difficult to see: the ecological processes of which we are a part, the ongoing process of human evolution, the unique history of our individual lives, mental and emotional processes of which we are unconscious, behavior, the processes of our power and love relationships.

Always judgment in description

Finally, it is important to recall that the designating of something as a "fact" is an act of judgment, an assignment of value. I cannot collect a single fact without having designated it as important and relevant for some purpose. This factor influences what aspects of processes we conceptualize.

Understanding the Ideas of Opposites and Opposition

Second axiom: circulation

Inside of everything there is the seed of its apparent opposite. The equilibrium between opposites depends on a balanced circulation of energy, Ichazo says in his second axiom.

Trialectical view of opposites

For many centuries human beings have struggled to understand the idea of opposites. Philosophers have sometimes called them antinomies and polarities.

Some have confused opposites with contradictions. Engels, for example, reified the logical notion of contradiction into conflict among forces and entities.

The trialectic position sees opposites as containing each other, or interdependent with each other. Their opposition is only "apparent." Metaphorically, each side of a pair of opposites contains the seed of the other side.

According to Ichazo, opposition is only apparent. Only in our human conceptions do opposites exist at all. They do not exist in nature.

Antagonism projected

Humans tend to see antagonism in nature, but this is only a projection, resulting from our capacity for producing opposites. Species are vast interconnected ecological systems which depend upon each other. From a cosmic point of view, there really is no "struggle," not even a struggle between the species.

The dialecticians of the last century saw the world as a struggle of opposites. There was clash, push and pull, killer and killed, war and effort. With our historical perspective, we can see that this vast metaphorical system influenced psychology, economics, and biology, as well as physics.

Understanding the Ideas of Opposites and Opposition, Continued

Antagonism projected (continued)

However, contemporary dialecticians, while typically holding on to the notion of the struggle, in fact have seen the relationship holding between opposites, and so have modified dialectics sufficiently to comprehend the emerging trialectic viewpoint.

Ichazo's Analysis of Process

Four elements in analyzing process

How do we conceptualize process most usefully? Ichazo suggests we do this analysis with a group of metaphors based on the idea of attraction.

There are four elements to identify in understanding change, according to Ichazo's trialectic formulation:

- the result
- the attractive
- the active
- the function.

In the next few pages we shall examine these four elements.

"Result" as an Element of the Analyzing Process

Result is defined for analytical purposes

Process or change refers to something becoming something else. For convenience we can call this "something else" the result, acknowledging, of course, that the result itself is also changing.

Since each analysis depends on our purpose, we may choose to designate a variety of phenomena as results, even in examining the "same" process.

The Attractive and Active Elements in Analyzing the Process

Fundamental to dynamics of change

Ichazo suggests the most general way to analyze flow is to recognize two interdependent components, the active and the attractive elements. In particular sciences, particular classes of processes have been analyzed and the energy components designated in many ways.

He suggests that we can treat all specific changes as subsets of one general set that can be analyzed from the active-attractive viewpoint.

The Attractive and Active Elements in Analyzing the Process, Continued

Fundamental to dynamics of change (continued)

Ichazo (1976) gives the following example of the working out of action, function, attraction, result. When a person feels hungry, he is in the attractive position and food is active. The function joining them will be the process of digestion and the result will be satisfaction. After this, the body becomes the active element while the feeling of satisfaction is attractive. The function connecting them is assimilation and the result is a satisfied body. Next, the body is the active element once again, while some external goal (work) becomes atractive. Now the function is work (expending energy) and the result will be a tired body.

Inter-dependence of active-attractive

It is important to see that the parts of processes are interdependent. Farmers and consumers are interdependent. The phrase "labor problem" indicates a one-sided dialectical view. Trialectics would define the situation as a labor-management process. Teacher-student are interdependent parts of a single system. Sometimes one is active and the other attractive.

At other times, they reverse roles. These examples point out that there are chains of trialectic processes as well as simultaneous interrelated processes within a given living organism or society.

Furthermore, we should note that Ichazo describes the active as always containing the "seeds" of the attractive; and vice versa, the attractive contains the seed of the active. The "active" is *attracted* and is receptive or susceptive in that fundamental sense. The attractive attracts and is "active" in that fundamental sense.

Examples: water

Let us look at some examples of a very simple trialectic analysis. We look at a process of water changing from one state to another:

Process: melting of ice
Result: water
Attractive: a chunk of ice
Active: source of heat

Or:

Process: evaporation of water
Result: water vapor
Attractive: water
Active: source of heat

Frequently, Ichazo also uses the words "function" and "equilibrium" for the term "process."

The Attractive and Active Elements in Analyzing the Process, Continued

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Example: biological

An example in biological analysis (from the point of view of a soil nutrient chemist) can be stated simply in trialectic analysis in this way:

Process: a plant absorbing nutrients
Result: the plant at any given stage in its life
Attractive: the plant
Active: nutrients from the soil

A plant physiologist, on the other hand, would view the nutrients as attractive, and the plant as active. Certain ecologists would want to keep both points of view in mind.

At more detailed levels of analysis, the analysis must be equal to the level of complexity. No matter what level of analysis you choose, you must make an assignment of active/attractive, although in some cases it is difficult to decide which is which.

Example: psychology

An example at the level of human psychology:

Process: reasoning
Result: solution, understanding
Attractive: the unknown, "X", the feeling of puzzlement
Active: mind

Comment: simple examples

I have given only very simple examples here. There is a danger readers will assume that trialectics can be applied only to simple problems. Nothing could be further from the truth. For example, Caswell (1982a) has shown that trialectics is quite compatible with the systems approach to modeling complex ecological systems.

The "Equilibrium" as an Element in Analyzing Process

Meaning of equilibrium

The concept of equilibrium helps define MMPs. "A mutation is completed when internal equilibrium has been achieved," says one of Ichazo's corollaries.

His conception of material manifestation points refers to relatively stable situations that exist for certain durations between states of transition (or mutation).

The "Equilibrium" as an Element in Analyzing Process, Continued

Meaning of equilibrium (continued)

You and I are discussing trialectics. We are an MMP. As long as information flows back and forth between us, maintaining an equality of participation in the increasing mutual comprehension of the subject in the single MMP composed of our minds, operating trialectically, this MMP endures.

As soon as one of us begins closing his mind, or one of us tries forcing his views on the other, the energy (as information, affection, etc.) ceases to circulate in a balanced flow, the "internal equilibrium" which assures the existence, the manifestation of this particular MMP is lost and the energy-level required to maintain the MMP "the-two-of-us-discussing-trialectics" dissipates into a lower MMP, you, and me, engaged in a dialectical struggle.

Or, lower still, it deteriorates into our believing the formal logic "A is not not-A" about ourselves and each other: "I am I and I believe A, B, and C, while he is the way he always was and will be, believing X, Y and Z." The next lower step might be a split into two independent MMPs who don't speak to each other.

Procedure for identification of equilibrium

In the second sentence of the second axiom Ichazo emphasizes that "the equilibrium between opposites depends on a balanced circulation of energy." This suggests that it is a good idea to look for the "balance" in the process we are analyzing. We can ask, "Are the various components (or opposites) in a relatively stable condition?"

Pre-established Laws, MMPS and Patterns

Meaning of pre-established patterns

One of Ichazo's corollaries says, "The energy moves in a universe with pre-established laws and pre-established MMPs or within pre-established patterns." At this moment, then, everything is not possible, as some philosophies suggest. This leaves little room for anything but some sort of determinism.

Ichazo's system implies limits. What is possible at this moment is established by the laws of the universe and recent MMPs.

Pre-established Laws, MMPS and Patterns, Continued

Meaning of pre-established patterns (continued)

At any given moment there will be several "lawful" possibilities open. Each of them has its several lawful results. Life is like a game of chess. There are only certain possible moves, and the moves we make are determined by how well we know the game. We can play it expertly or play it badly. We can also define freedom in such a way that we mistake refusing to learn to play the game as exercising free will. We can even go so far as to deny that the game of chess exists. In some cases what people hold on to as freedom turns out, on closer examination, to be nothing more praiseworthy than ignorance.

The axiom of mutation says that MMPs change into other MMPs, but that only the laws governing change do not change. This is a major assumption of a science, i.e., that it is possible to study the patterns of the universe through the combination of our senses and our intellect. This corollary then is the one in which Ichazo incorporates the assumptions of scientific method as a part of the trialectic point of view.

Question of determinism and free choice

On the question of free choice and determinism, Ichazo appears to occupy a position similar to that so elegantly expressed by LeShan and Margenau (1982) in which they say, "Our thesis is that quantum mechanics leaves our body, our brain at any moment in a state with numerous (because of its complexity we might say innumerable) possible futures, each with a predetermined probability. Freedom involves two components: chance (existence of a genuine set of alternatives) and choice. Quantum mechanics provides the chance and we shall argue that only the mind can make the choice by selecting (not energetically enforcing) among possible future courses."

The Place of "Accidents" in Trialectic Thought

Random accidents or purpose

In one of his corollaries, Ichazo says, "From a cosmic point of view, there are no random accidents, but processes in circulation." In commenting on that proposition in one of his lectures, he mentions that one of the major preoccupations for him was the question, "Is the world a random event, or does it have meaning, purpose, direction?" This is one of the great questions of philosophy. Ichazo's experience led him to embrace the latter view. The truth of this point of view each person must judge on the basis of his own experience. As to its being a more fruitful point of view, the evidence appears highly confirmatory. It is much more fruitful to operate from the point of view that we move in a universe of purpose than from the viewpoint that we live in a random universe.

The Place of "Accidents" in Trialectic Thought, Continued

Accidents and luck

Ichazo goes on in another corollary to say flatly, "In nature there are no accidents." How is this different from the previous statement?

Human beings like to blame "accidents" and "chance" and "luck" for events. If we look carefully at each event which they are claimed to have governed, we find that "luck" and "accident," in fact, do not exist. Only because human thought is slow and limited do we fail to see the natural movements and processes that occur.

Accidents and luck are our projections onto nature. They are our "excuses" for not being aware of what is going on. There is by definition nothing that "just happens." There are no violations of the laws of the universe. There are no accidents; there is only unawareness of the laws involved.

How we are responsible

Ichazo leaves us in a practical sense without excuses and without blame. There are laws and pre-established MMPs that have determined our lives to this moment. On the other hand, at this moment we also have the clarity of perception and reason to choose.

One thing human beings can choose to do is work to clarify their consciousness, and thereby achieve real freedom and an understanding of what their choices really are. Responsibility is a matter of achievement.

The Place of Hierarchical Levels in Trialectics

Third axiom: attraction

The perpetual motion of all creation is due to the interchange of energy between MMPs and there is, therefore, an inherent attraction to either a higher or lower MMP.

Universe structured in levels

Ichazo introduces the concept of levels with the idea that there is an inherent attraction to either a higher or lower material manifestation point. What does he intend by focusing one major axiom on such levels?

There are the obvious divisions of the world we know: our galaxy, the solar system, our planet, plants, animals, human beings. In evolution, the appearance of life and then of human consciousness represent large changes in scale.

The Place of Hierarchical Levels in Trialectics, Continued

Universe structured in levels (continued)

The chart below shows levels of aggregating space-time events into larger, more comprehensive wholes (modified table from Laszlo 1972)

MACROCOSMOS

- Metagalaxy — astronomical universe
- Galaxy aggregations
- Galaxies
- Stellar clusters
- Stars, planets

ECOCOSMOS

- World system
- Ecosystems
- Social systems
- Organisms

MICROCOSMOS

- Cells, protoorganisms
- Crystals, colloids
- Molecules
- Atoms
- Electrons, nucleons, photons, radiation, quanta
- Fundamental energy condensations (quarks?)
- Space-time field and energy continua

Meaning of higher and lower

But Ichazo means more than this macroscopic-microscopic structural distinguishing of levels. He says in one of his corollaries that a process is "ascendant or descendant."

Here he is saying that each change involves an increase or decrease of stability (structure, form, internal complexity, number of internal laws), or on a personal level, greater or lesser openness to other persons (person, social system), a greater or lesser awareness of our own internal processes. The determining factor is level of consciousness, whether consciousness is manifesting as lifeless matter, living organisms, or human beings.

Higher theory explains more with fewer statements or assumptions. A higher, more integrative point of view has a greater scope and enables the viewer to see farther.

The Place of Hierarchical Levels in Trialectics, Continued

Meaning of higher and lower (continued)

Thus, the higher the point of view, the smaller number of restrictions attached to it. This principle must be taken in conjunction with the discussion of Ichazo's levels of consciousness. The higher the level of consciousness, the fewer illusions, beliefs, and mind structures impeding personal consciousness.

Ichazo juxtaposes lawful ascending and descending process with the dialectical statement of higher synthesis arising out of the conflict of thesis and antithesis.

The words "superior" and "inferior" are not intended to propose an ultimate judgment of morality, good or bad, but only a statement of relations on a scale, a statement about the place of an MMP in a scale.

Example: psychology

In a relationship, I can pay attention to what is trialectically attractive. And I can use my intellectual abilities to determine whether the attraction is to a higher or lower MMP.

My wife wants to go to the movies. I am angry at her for what she said at the dinner table. I am attracted to telling her that I am resentful and working through that resentment (to a higher MMP, since it would be more conscious, more harmonious, expressive of greater unity) but I am also attracted to remaining resentful and getting back at her by telling her that I don't want to go to the movie, thus effectively spoiling the evening for both of us, a lower MMP.

The Role of Levels of Consciousness in Trialectics

Science has no levels of consciousness

The prevalent scientific viewpoint is materialist. Its aim since Descartes has been reductionist: to produce mechanistic models of phenomena.

One result of materialist assumptions is to reduce consciousness to a by-product of brain activity. An assumption that has been implicit in this viewpoint is that there can be only such levels of consciousness as awake, asleep, and dreaming.

The Role of Levels of Consciousness in Trialectics, Continued

Science has no levels of consciousness (continued)

Some of the momentous battles in what Jay Ogilvy and Peter Schwartz call "paradigm wars" (1983) will be fought over this assumption. Ichazo is flatly on the side that takes the opposite assumption, i.e., that there are many distinct levels of consciousness.

Definition of consciousness

According to Ichazo, by its very nature, consciousness allows no formal definition, yet a functional definition is possible: "Consciousness is that which recognizes itself." Consciousness, too, has pre-established points of material manifestation and these are what is meant by levels of consciousness.

Ichazo posits levels of consciousness

In various lectures, Ichazo (1976) has described a set of levels or scales of human consciousness. One recognition in trialectics is that all human beings operate at a specific and definable level of consciousness each moment of their lives.

Movements in the Levels of Consciousness

Humans attracted to higher and lower levels

In Ichazo's trialectics, human beings at any given level of consciousness are material manifestation points. So we may assume that we, too, are attracted to higher levels as well as lower levels.

Normally, human beings are attracted to higher levels of consciousness. Sooner or later, all human beings are attracted toward the level of self-realization.

Process of disillusionment

But to achieve that level, one must pass through levels of disillusionment, the giving up of our illusions. These illusions include our mind structures, beliefs, and social conditioning. We must see our culture for what it is — an invention, not reality.

We must also see with dispassionate clarity the illusions of our own life. This is not an easy thing to do, to see all of the unpleasantness of our lives with calmness until there is no more negative emotional charge. Perhaps equally difficult is giving up our attachment to the pleasant moments.

Movements in the Levels of Consciousness, Continued

Process of disillusionment (continued)

Typically, at the point of approaching disillusionment, we want to look away. We do not want to reexamine all the contradictions, hurts, and resentments of the past, which we must do to reach a higher level in the scale of realization.

If we do not rise, sooner or later we are attracted to lower levels again, to the security and comfort of not looking at ourselves. The process of this disillusionment — which may be called maturity — is experienced by everybody. It may be speeded up by certain types of experiences (e.g., by approaching death) and by training programs.

Self-observation is critical

In such training programs, systematic self-observation plays an important part. It involves the discovery — or development — of a "witness" within ourselves (which is quite different from the super-ego of Freud in that the witness is dispassionate and non-critical).

Absence of witness produces contradiction

Persons who do not have the point of view of witnessing the process will be involved in struggle either with conflicting parts of their own personality or with other people onto whom they project their conflicts.

They will be attached to their expectations about themselves and the outside world. This attachment to outcomes, these expectations, can only produce contradictions, which lead to lower levels of MMPs.

Example: trying to please

A woman frequently feels she must please her husband, her children, and her parents, all of whom have different expectations. She will be drained by her struggle to please and operate at a lower MMP than she might if she were more aware of her need to please.

Absence of witness depletes energy

We sometimes decide upon a goal, no matter how unrealistic, and then struggle to impose our own way on the situation. This results in contradictions. Contradictions lead to lower level MMPs, and human beings have manifold ways of producing contradictions. The implication is that we will produce contradictions until we get our own psyches into balance.

In personal terms, if you don't have a dispassionate witness, you're going to feel pushed and pulled about by your environment. You will end up in an inferior MMP (or condition) at the end of any given period of struggle (drained of your energy).

Movements in the Levels of Consciousness, Continued

Example: arguments

Two persons seeing opposite limited sides of an issue often get into argument, hassle, frustration, and anger as they try to "force" the other to agree. The result of this process is always less unity and hence a lower MMP. As Oliver Wendell Holmes said in *Autocrat of the Breakfast Table*, "Controversy equalizes fools and wise men in the same way — and the fool knows it."

Applications of Trialectics

Two types of applications

We are now in a position to see more comprehensively how we may use formal logic, dialectics, and trialectics in the analysis of practical problems. There are two principal ways that trialectics can be used:

- as a critique of analysis when it has been completed
- as a beginning point for an analysis of problems.

It is beyond the scope of this paper to give detailed case examples, but the following will suggest some of the approaches.

Using Trialectics to Critique Completed Analysis

Analyzing our analysis

One of the ways that the trialectical point of view may be used is as a continuing test against which to put a current piece of analysis or description of the world. Among the things we can do is to check to see if we have fallen in the formal logic and dialectic traps.

Formal Logic traps

Among the traps we can fall into are the:

- *Reification Trap.* Am I thinking in terms of reality which is filled with fixed objects and things?
- *The Forever Changeless Trap.* Am I thinking of the current condition as being the same forever?
- *The Independent Self Trap.* Am I separating organism from environment, myself from my interdependence with others?
- *The Isolated Problem Trap.* Am I regarding the problem as unconnected, without regard to wider contexts?
- *The Single Effect Trap.* Am I thinking that I can cause a single effect with no "side effects"? "You can never do only one thing." (Hardin 1972)

Using Trialectics to Critique Completed Analysis, Continued

Dialectic traps

Among the traps we can fall into are the:

- *Inevitable Antagonism Trap.* Am I assuming that there is inevitable conflict between persons, organisms, nation states?
- *Force Can Do It Trap.* Do I immediately think in terms of forcing my solution on the situation? Do I think, "I can force them to change"?
- *No Limits Trap.* Do I assume limitless resources and area for action?
- *More is Better Trap.* Do I assume that anything can be solved by application of more resources?

Misapplications of Trialectics: Potential Traps

Introduction

It is also possible to misapply the concepts of trialectics.

Formal logic and dialectic points of view can "take over" the concepts of trialectics and bend them to their own purposes.

Mindless attraction trap

Some, who have only superficially learned trialectics, latch onto the idea that "If I simply feel attraction, then I must be acting trialectically."

This may be just another way of talking about the experience of needs, habits, or desires, which is anything but the experience of freedom of choice subject to the limitations of natural laws which is inherent in trialectics. Any feeling of attraction is not automatically a trialectical point of view.

Trialectics is all you need trap

Some persons initially impressed by the trialectic point of view have stopped learning other specialized fields and have assumed that Ichazo is suggesting formal logic and dialectics are useless.

These people will not be able to apply trialectics appropriately to specific problems and will expect trialectics to do that for which it was not intended.

Trialectics as a weapon

"You're not acting trialectically," has on occasion been used to bludgeon people into acquiescence, but of course it is simply an example of a dialectical point of view.

Misapplications of Trialectics: Potential Traps, Continued

Endless analysis trap

Another potential trap in doing trialectic analysis is to go on asking questions and making analysis without coming to a decision and action. This is an example of the illusionary hope that you will somehow obtain perfect information with sufficient work, a dialectical notion.

Future forecasting difficult

Trialectic analysis assumes that you can identify and describe the governing principles in situations that have not yet occurred so as to make forecasts. Unfortunately, a very small percentage of such governing principles (laws) are known. The literature on future-forecasting clearly demonstrates that we have a long way to go before we understand many situations in the social and political realm well enough to easily predict future events.

Mechanical analysis trap

On the more subtle side, there are those who use trialectics in a mechanical way. They follow their interpretations of the axioms as if they were a set of rules of behavior. For example, they reason: "You're either in trialectics or you're not," (which is formal logic thinking). Can one be partially in the trialectic point of view? Yes, and it appears that some trialectical point of view is a higher MMP than none.

Using Trialectics as a Starting Point for Analysis

Useful questions to guide analysis

Trialectics can be used as a set of assumptions and methods for improving the analysis of problems. Here are some useful questions for doing trialectic analysis:

Level. What is the level of consciousness — in me, in the group I am dealing with?

Seed of Opposites. How can this become its opposite? What are the seeds of the opposite that are already in this situation? How can we foster or slow down the growth of opposites here?

Polarity Stuck. Am I stuck on one side or the other of a pair of opposites here?

Limits. What are the limits to our goals and resources here?

Largest Wholes. What are the largest wholes that need to be considered in this analysis? Evolution? The planet as a living ecosystem? Humanity as a whole? How can we expand our view of the whole situation to encompass all the relevant areas?

Using Trialectics as a Starting Point for Analysis, Continued

Useful questions (continued)

Attraction. How do I feel the attractions in this situation? How can I get into the attractive position here? How can I make this attractive for the other people in the situation?

Accelerate Movement and Define Consequences. How can we accelerate the movement toward a higher MMP? What are the consequences of different actions and of other MMPs?

Energy-Information Exchange. How are the subsystems exchanging information and energy? How can this be changed?

Higher-Lower MMPs. What are possible next higher MMPs? Next lower MMPs? How can I see this in terms of scales of quality of higher and lower MMPs?

Increase-Decrease Attraction. How can we increase or decrease the attraction of possible MMPs?

Too Abstract. Am I being too abstract? Am I overlooking the real function (equilibrium) here?

Too Idealistic. Am I being too idealistic here? Is it possible I've substituted a final or distant MMP for a closer, more accessible one?

Moral Judgment. Am I getting stuck in moral judgment? How can I be objective (non-judgmental) in this situation? Am I attached to a specific pleasure/pain situation? Am I stuck in blame or guilt about the past?

Consequences. What are the consequences of different actions? And of other MMPs?

Excuses. Am I looking for excuses rather than accepting the world as having to be the way it is at this moment with no accidents?

Drop Contradiction. How can we drop the contradiction that is pulling us toward a lower MMP?

Unities. What types of higher unities are possible here?

Comment on questions

Some of these questions are directly derivable from specific axioms of Ichazo. Others are not original to trialectics but harmonize well with the trialectic point of view.

The Importance of Trialectics

Unitary view expressed axiomatically

The thesis of this paper has been that there is an emerging third point of view that goes beyond formal logic and dialectics. We find aspects of the emerging point of view in many authors. Ichazo has put many of these concepts together. He has expressed this holistic point of view in a distinctive set of axioms and corollaries. Unity can be seen more coherently through the telescope of trialectics than through many of the other holistic approaches.

The post-Einsteinian scientific world view has considered things and processes as space-time events. Trialectics supplies a rationale for seeing mental events, human events, and events in nature from a single point of view. Trialectics then gives the paradigm all of its elements, inside our skins as well as outside.

Capable of specific application

Ichazo's presentation in the form of axioms and corollaries fits our Western analytic stance. His approach applies to problems in a wide variety of areas.

Ichazo's formulation is simple, concise, economic. This permits us to use his axioms and corollaries as moment by moment critiques of our thinking. It further permits us to use them as a starting point for analysis of complex problems. Perhaps trialectics will permit us eventually to achieve a greater intellectual unity in solving our planetary problems.

Notes

Revised version of paper

This paper is a revised version of a paper I wrote in 1976 called "An Overview of Trialectics." The principal changes I have made since then correct several of my misunderstandings of trialectics and amplify some of the examples.

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Appendix. The Axioms and Corollaries of Trialectics (1976)

Introduction Ichazo's statement of the axioms and corollaries has changed slightly over the last decade. The version in this appendix is included for tutorial purposes.

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1. Axiom of mutation A material manifestation point (MMP) mutates into another MMP.

(a) In a mutation the equilibrium is internal, is function and generally is pure, invisible action. Within every process there are four elements: the attractive, the active, the equilibrium (or function), and the result.

(b) The MMPs, the jumping points, are neutral points of retention of energy.

(c) We move in a universe with pre-established laws and points.

(d) The absence of function provokes contradiction which in turn struggles to find equilibrium that can only be resolved downward.

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2. Axiom of circulation Inside everything is the seed of its apparent opposite.

(a) From the cosmic viewpoint, opposites do not exist.

(b) From the cosmic viewpoint, there are no collisions; there is circulation, that is, process.

(c) In nature there are no accidents.

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3. Axiom of attraction Higher MMPs are subject to a smaller number of laws.

(a) Higher MMPs are more permanent and have a greater range, less internal movement, and greater exterior expansion.

(b) MMPs are pre-established; they are not accidental.

(c) One MMPs attraction to another can be ascending or descending.

Source: Adapted from Ichazo (1976) and his lectures prior to this time.

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Chapter 2
An Injunctive Form of the Axioms of Trialectics

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Introduction

Trialectic axioms: metaphysical principles

Discussions of the axioms of trialectics (Ichazo 1982) usually present them in descriptive form, and contrast them to descriptive versions of the axioms of formal logic and of dialectics. In this form, these axioms are attempts to describe the nature of reality. In logical terms, these presentations of trialectics are existential statements (i.e., there *exist* material manifestation points and mutations between them, inside everything *exists* the seed of its apparent opposite, there *exist* higher and lower MMPs and relationships of attraction between them).

In descriptive, existential form, the axioms of trialectics are clearly metaphysical propositions, since they cannot be falsified by empirical statements. That is, there is no empirical observation which, if accepted as true, would imply that these existential statements are false.

Metaphysical research programmes

The role of frankly metaphysical principles in scientific activities has been investigated by a number of authors. The most well known example is the work of Kuhn (1962), who introduced the term *paradigm* to describe them. Holton (1973) refers to them as *themata*, and Lakatos (1970) has published a lengthy discussion of what he refers to as *scientific research programmes*. Perhaps the most useful term for our discussion here is that introduced by Karl Popper (1982, originally 1956), who refers to such principles as *metaphysical research programmes*. These programmes function by (1) directing the attention of scientists to particular problems, (2) by suggesting approaches to those problems, and (3) by defining the criteria which identify successful solutions to those problems. The metaphysical research programme terminology highlights both the metaphysical nature of the principles involved and their function in directing scientific activities.

Problems with descriptive form

When stated in their usual descriptive form, principles such as the axioms of trialectics invite an antagonistic response from a scientist, who can legitimately demand rigorous tests of their assertions. I must emphasize that it is not a sufficient response to such arguments to document examples which seem to fit trialectics. A scientist can (indeed, his training demands that he should) always argue that the example chosen can be described equally well by some other system, or can grant the success of the example but point out that universal existential statements cannot be conclusively demonstrated by any finite number of examples.

Injunctive form

If, however, the role of trialectics as a metaphysical research programme is clearly specified, the grounds for critical discussion change. One way to achieve this is to emphasize the role of the programme in directing scientific investigation by framing the axioms of trialectics as directions, that is, in an injunctive rather than in a descriptive mode. Such an injunctive version of the laws might look something like the following.

Injunctive Form: Trialectics

The axiom of mutation in injunctive form

The injunctive form of the axiom of mutation can be stated:

In attempting to understand any process, search for its limits, for the stable manifestations exhibited by the process, and for the transitions between these stable manifestations. For each component of the process, attempt to identify

1. the attractive variables (those aspects of its environment to which the component responds)
2. the active variables (those aspects of the component which determine its susceptibility to the attractive)
3. the result (the aspects of the behavior of the component which are to be explained)
4. the function which determines the result, given the active and attractive elements.

The axiom of circulation in injunctive form

The injunctive form of the axiom of circulation can be stated:

In attempting to understand any process, search for a description in which each element can be seen to contain within itself the seeds of its apparent opposite. Search for the way in which cycles connecting these apparent opposites are completed, either within the system or through the connection of the system to its larger context.

Injunctive Form: Trialectics, Continued

The axiom of attraction in injunctive form

The injunctive form of the axiom of attraction can be stated:

In attempting to understand any process, search for a hierarchy of levels which allow MMPs to be classified as higher or lower in energy, greater or lesser in range, or subject to a greater or lesser number of restrictions.

Advantages: value as programme

I see several advantages of stating these axioms in the injunctive mode. First, it completely changes the emphasis of the discussion, from the *truth* of the laws as descriptive statements to the *value* of the laws as a programme for understanding processes. This programme can be related to the principles of systems theory and cybernetics, and thus to the actual procedures used by biological, physical, and social scientists in studying dynamics (Caswell 1983).

Advantages: direct attention

The injunctive version also focuses attention on the way in which metaphysical systems of this sort influence one's view of the world, especially when contrasted with injunctive versions of formal logic and of dialectics. After all, formal logicians and dialecticians have always wanted to understand the world, too. Why haven't they seen the need for a trialectical perspective? Not, surely, because they never noticed the existence of change, of stable manifestation points, of cycles, of levels, and so on, but because their programmes directed their attention away from these phenomena, and towards other aspects of reality. For the sake of contrast, here are tentative injunctive versions of the laws of formal logic and of dialectics, interpreted as metaphysical research programmes.

Injunctive Form: Formal Logic

Injunctive form of axioms of formal logic

The axioms of formal logic can be restated injunctively:

1. *The axiom of identity:* In attempting to understand any process, search for the essential, unchanging identities of the components involved.
2. *The axiom of contradiction:* In attempting to understand any process, search for the factors which distinguish one thing from another.
3. *The axiom of the excluded middle:* In attempting to understand any process, eliminate that which doesn't fit exclusively into a single category.

Injunctive Form: Formal Logic, Continued

Injunctive form of axioms of formal logic (continued)

One way to eliminate is through a hierarchical classification, in which items which fall in different categories at one level may be in the same category at a higher level. (See Voorhees' [1983] paper in this volume.) Cats and dogs, for example, are both mammals; mammals and birds are both vertebrates, and so on. Failure to recognize the hierarchical structure of such a taxonomy leads to confusion in attempting to answer such pseudo-questions as whether cats are mammals *or* vertebrates.

Injunctive Form: Dialectics

Injunctive form of axioms of dialectics

In injunctive form the axioms of dialectics can be stated:

1. *The axiom of quantity and quality:* In attempting to understand any process, search for the sources of energy, force, or power driving the transformations.
2. *The axiom of contradiction:* In attempting to understand any process, search for the sources of conflict, opposition, or contradiction which produce the changes.
3. *The axiom of negation of the negation:* In attempting to understand any process, search for sequences of the form: thesis-antithesis-synthesis, generated by the contradictions discovered in step 2.

Conclusions

Injunctions tend to produce active participant in study

Finally, appreciation of the injunctive version of these laws leads to a completely different personal experience of trialectics, because it places one in the position of an active participant in a study of process, rather than in the position of a passive listener to a description of how things are supposed to be. G. Spencer-Brown (1972) emphasizes this aspect of injunction in a discussion of the foundations of mathematics; his points apply equally well in the present context:

Conclusions, Continued

Injunctions tend to produce active participant in study (continued)

"It may be helpful at this stage to realize that the primary form of mathematical communication is not description, but injunction. In this respect it is comparable with practical art forms like cookery, in which the taste of a cake, although literally indescribable, can be conveyed to the reader in the form of a set of injunctions called a recipe. Music is a similar art form. The composer does not even attempt to describe the set of sounds he has in mind, much less the set of feelings occasioned by them, but writes down a set of commands which, if they are obeyed by the reader, can result in a reproduction, to the reader of the composer's original experience . . .

"Every natural science appears to be more dependent upon injunction than we are usually prepared to admit. The professional initiation of the man of science consists not so much in reading the proper textbooks, as in obeying instructions such as, 'Look down that microscope.' But it is not out of order for men of science, having looked down the microscope, now to describe to each other, and to discuss amongst themselves, what they have seen, and to write papers and textbooks describing it. Similarly, it is not out of order for mathematicians, each having obeyed a given set of injunctions, to describe to each other what they have seen, and to write papers and textbooks describing it. But in each case, the description is dependent upon, and secondary to, the set of injunctions having been obeyed first."

Applications to everyday life

Finally, it goes without saying that a programme for the understanding of complex processes has applications in everyday life (a complex process if ever there was one) as well as in the context of scientific research. Horn's (1983) contribution to this volume includes examples of the contrasting reactions which result from following formal logical, dialectical, and trialectical programmes in a variety of situations.

Notes

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I would also like to acknowledge the kindness of Sir Karl Popper in allowing me, some years ago, to read his then unpublished material on metaphysical research programmes.

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Chapter 3
Trialectics and Rational Theory Construction: A Theory of Theory

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Reason and Theory Construction

Overview of this paper

I am going to examine the process of theory construction from three different viewpoints, exemplified in papers by Royce (1978), Kuhn (1977 a and b), and Polanyi (1969). The claims I will make are that these viewpoints can be characterized as logical, dialectical, and trialectical reasoning respectively; that these three are necessary and sufficient for theory construction, and that evidence for my claim exists in the history of science.

To substantiate the first part of my claim, I will define what I mean by the terms logic, dialectics, and trialectics, and indicate how each of the above mentioned papers exemplifies one of these, not to the exclusion of the others but in style and emphasis. In support of the second part of my claim I will present a model of theory construction. In this model the forms of reasoning I am calling logic, dialectics, and trialectics will play a central role. Finally, I shall apply what I have presented to an analysis of a historical example: the history of physical optics as described by Kuhn.

Incidentally, I will argue that the viewpoint I am presenting provides the most natural way to see both Polanyi's concept of tacit knowledge and Kuhn's concept of paradigm science and revolutionary science.

I will begin by discussing reason. Then I will summarize what I consider to be the essential points of the Royce, Kuhn, and Polanyi papers as they relate to theory construction. This will establish my first argument — that the viewpoints of these three papers are mutually consistent, differing primarily in emphasis, and are subsumed under the general classification of reasoning — as I will have defined it.

Reason: a definition

I will consider reason as a mental tool for drawing conclusions about the world. The terms reason and rationality are derived from the Latin *ratio*, which in its original sense refers to comparison by measure against a standard.

Reason and Theory Construction, Continued

Reason: a definition (continued)

Something that is rational is something that is, *metaphorically*, measured — bounded within an accepted set of standards — in this case, standards for what is to constitute a rational statement, argument, or conclusion.

It is accepted that syllogistic argumentation from consistent initial premises is rational because it follows the established standards of formal logic.

Rationality depends on consensus

Rationality is a relative concept and depends for its definition on the consensus of a community of *presumably* rational beings. This is, for example, Rosenberg's (1976) position as expressed in his paper on linguistic correctness, as well as that of Berger and Luckman (1966) expressed in their concept of a socially defined *symbolic universe*. That different communities accept different standards of rationality is one of the major sources of conflict in our world.

Scientific theory: interprets empirical findings

The essence of a scientific theory is that it is a rational construct for the purpose of providing insight into empirical occurrences. Thus, to say something about theory construction, I need to begin by discussing what forms of reasoning will be allowed in the process of construction. I will discuss three distinct ways of reasoning. In this exposition I am following Horn's (1983) presentation of the metaphysical writings of Ichazo (1976, 1982).

Three types of reasoning

Ichazo's metaphysics distinguishes three different ways of reasoning called formal logic, dialectics, and trialectics. The characteristics of each can be given in axiomatic form. I will discuss each of these forms of reasoning, or *viewpoints* as Horn refers to them, beginning with formal logic.

Introduction to Formal Logic

Definition of axioms

Formal logic refers to the three axioms of Aristotelian logic. This is the basis of syllogistic reasoning and scientific classification. (See Dell'Olio [1983] in this volume.) Its mathematical representation is Boolean algebra, viewed in modern mathematics as an algebra of sets. The axioms of this logic are mathematically equivalent to the definition of an equivalence relation. The axioms of formal logic are:

Axiom of Identity: A thing is equal to itself.

Definition of axioms (continued)

Axiom of Contradiction: A thing is not equal to anything other than itself.

Axiom of the Excluded Middle: No thing is equal to both of two distinct things.

The term contradiction contains many traps. (See D'Andrade and Johnson [1983] in this volume.) For example, it leads some dialectical thinkers to believe that there is real contradiction in nature. For this reason I suggest that the axiom of contradiction be renamed the axiom of distinction and stated as: A thing may be distinguished from things other than itself.

Three ways to define sets

Expressed in set theoretic terms this provides the appropriate language for a science of systematics, as follows: Sets can be defined in three independent but *not* exclusive ways — by enumeration, description, and abstract indication. Enumeration simply lists the elements of the set. Examples of descriptions of a set are: the set of all real numbers; the set of all men over six feet; in general, the set of all A such that P(A) where P(A) is a description or a set of consistent propositions. Finally, a set may be defined abstractly by indicating an index set:

$$\{A_i | i \in I\}$$

In general, index sets are abstract mathematical sets and the advantage of this mode of definition is that of mathematical abstraction: Nothing but the basic structural relationships are retained.

Advantages of each type of definition

The first form of definition is relevant for dealing with direct empirical data. The second form is central when a taxonomy is solidified by redefining it in terms of theoretical principles induced from the data which suggested its original definition. (This is a step the phenomenologists refuse to take.) Finally, the third definition of set is central in constructing a formal mathematical representation of a theory.

Change not accounted for

This provides the necessary structural language for theory construction. Formal logic, however, cannot comprehend change. That is, it is a logic of identity whose axioms make no allowance for change. Among the many who have noted this, since it was first pointed out by Parmenides, are Korzybski (1958) and Hayakawa (1972).

Change not accounted for (continued)

The axiom of contradiction excludes the possibility of change. The essence of change is for a thing to become other than itself — but the axiom of contradiction prohibits a thing from ever being other than itself.

Aristotle's theory of change

Aristotle was well aware of this and explained motion and change with his theory of potentiality — that the change of an acorn into an oak, for example, was not the change of one thing into another but rather the unfolding of the innate potential of the acorn. Thus, in terms of identity, acorn and oak are identified as points of a single cyclic continuum parameterized, roughly speaking, by the degree of actualization of a certain potentiality.

Classical conception: potential energy

This paradigm of motion survived until the Renaissance, and can still be seen in the classic physical conception in which motion is ascribed, following Newton, to the action of forces which, at least in simplified examples, are defined in terms of potential energy.

In physics, forces which can be derived from a potential are called conservative because in systems operating under such force laws energy is conserved. Such systems are characterized (at least if the kinetic energy is sufficiently small) by periodic orbits in phase space, directly representative of the cyclic exchange of kinetic and potential energies occurring in the ongoing operation of the system as what is potential becomes actual (kinetic) and then returns to potentiality.

This conception of motion does not deal with irreversible change (such as friction), which in physics involves non-conservative forces.

Example: sliding block

The simplest example of such a non-conservative force is the case of a block which is slid along a table with given initial velocity v_0, acted on by a velocity dependent frictional force. The equation of motion can be written

$$\frac{dv}{dt} = -kv$$

where the constant k is called the coefficient of sliding friction.

Example: sliding block (continued)

The solution is $v = v_0 e^{-kt}$, or in terms of distance travelled:

$$x(t) = \frac{v_0}{k}(1\text{-}e^{-kt})$$

If $k = 0$ the system is conservative and the block moves with constant velocity. *Note:* According to this formula it requires infinite time for the block to stop — even though it traverses only a finite distance.

Introduction to Dialectics

Hegel's dialectics

By the 19th century irreversible change was a historic fact. Man's view of the world had changed radically since the time of Aristotle. In his dialectics Hegel provided a form of reasoning that could comprehend change. Hegel was an idealist. His idea was that all change was toward an Absolute Ideal and that change could be rationally described in terms of his dialectical logic.

The axioms of dialectics are:

Axiom of Quality and Quantity: Changes in quantity will produce changes in quality.

Axiom of Opposition: The potential for change comes from the irreconcilable conflict of opposites.

Axiom of the Negation of the Negation: Every thesis is negated by its antithesis, which in turn is negated by synthesis, which becomes a new thesis at a higher level.

Thus dialectics sees an infinite sequence of change. The end point of this sequence was the Absolute Ideal. In Marx's famous "inversion" of Hegel's idealist dialectic, the Absolute Ideal became the classless society.

Critique of quantity–quality

From my point of view, each of the dialectical axioms is open to criticism. Horn's (1983) comments on the first axiom indicate that this axiom puts no limits on the possible increases in quantity, leading to the paradox of Malthusian growth in a finite world.

Critique of opposition

Second, the axiom that the potential for change is generated by the irreconcilable conflict of opposites can be criticized by noting that things which momentarily appear in conflict may, in time, be seen to have been operating cooperatively. For example, certain enzymes are known to inhibit the action of other enzymes. From a synchronic perspective it might be said that this is irreconcilable conflict. Diachronically, it is the cooperative interaction of two components of a homeostatic system. The tie to Aristotle's logic here is through the law of contradiction. Hegel, in contemplating change, was forced to the conclusion that the fact of motion implied the existence of contradiction in nature. Thus the unceasing conflict of opposites.

Critique of negation

Finally, the axiom of negation of the negation. Because of this axiom, the Absolute Ideal, or the Classless Society, can be approached rationally, but can never be attained by rational means. Dialectical change is endless. This is well known. Ortega y Gasset (1968), for example, takes note of this and then recommends that one pursue a dialectical sequence five or six iterations, or "... until one gets tired." The reason is that each step of a dialectical sequence involves a synthesis of thesis and antithesis with the synthesis then becoming the thesis of the next step. Suppose such a sequence were to reach its end point. This end point would be a final synthesis such that were it taken as thesis it would either have no antithesis or would be its own antithesis. Such a statement cannot be contained in a universe of dialectical discourse.

The dialectical response to this is that such peculiar points *do* occur in nature, new things *do* appear, but they do so by *accident*. In order to describe change, the dialectician introduces *contradiction* and, as a consequence, must accept accident.

Example: sliding block

Returning to the example of a sliding block, we find that it takes infinite time for the velocity to be reduced to zero. The conflict between the motion of the block, its inertia, and the force of friction leads to a change in the state of motion of the block, but it is an endless change.

The *fact* that the block does come to rest in *finite* time is, in a physical explanation, attributed to *accidental* molecular interactions between block and table top, interactions occurring *outside* the analytic structure used to predict the block's motion, which can be treated only in a statistical way.

Example: unlimited population growth

An example of a dialectic analysis is as follows: Unlimited population growth in a world of limited resources will lead to social disorder. This is Malthus' (1959) argument, advanced in 1798, prior to Hegel's formalization of dialectics. Nevertheless, it is exemplary: The increase in the quantity of people in the world will lead to a change in the quality of their lives. The potential which produces this change is the unending conflict between the opposites of limited food supply and sexual pleasure. The synthesis of these is social collapse as the species reproduces beyond its food supply. There are well studied examples of precisely this process in the animal kingdom.

Dialectics, however, cannot explain the emergence of a functional unity (what Hegel would call an Absolute Ideal) except by accident. Thus Malthus could predict social collapse (dis-integration) but he could not predict the discovery of effective methods of contraception — specifically because this eliminates the contradiction which drives his dialectic and thus its occurrence can only be accidental from a dialectical point of view.

Historical notes: idea of change through conflict

Malthus' thesis was advanced by several persons prior to Malthus, including Goodwin and Adam Smith, indicating that the idea of a relationship between quantitative and qualitative change was "in the air" at this time. Further, Malthus is known to have strongly influenced Darwin. From a Hegelian perspective, the change of acorn to oak involves friction; i.e., non-conservative forces. That is, it is not a matter of a cycle parameterized by a degree of actualization, as it was for Aristotle. This would be the case only if each acorn produced one oak, which in turn produced only a single acorn. Rather, for Hegel, each oak produces many acorns, only a very few of which become new oaks.

This gives the potential for Darwinian evolution. For Aristotle every oak was an *actualization* of the ideal type. For Hegel the species of oaks was *evolving toward* the Absolute Ideal. The point of this digression is that Malthus, Darwin, and Hegel all tapped in on ideas that were current at their time, ideas which involved change through conflict.

Recall that this was also a time of great social change, of the American and French revolutions, and the beginnings of the Industrial Revolution. Malthus' exponential growth, Hegel's conflict of opposites, and Darwin's natural selection are all part of the same intellectual package.

Piaget on emergence in dialectics

In another context, Piaget provides an example indicating the inability of dialectical thought to comprehend emergence when he discusses Weismann's view of genetics, a view held by many geneticists during what, in anticipation of discussion later, can be called the descriptive stage of the evolution of the science of genetics. Piaget (1971) comments:

"The binomial character of Mendel's law of distribution, the discontinuous structure of forms . . ., *the apparent sharp and random jump characteristics of observed mutations* — all seemed to lead to that atomistic view of life . . . (my italics).

"Ideas such as this, still current in many circles, were eventually challenged by a series of new facts which are now inclining opinion toward a third position — an interpretation of the genetic system and the genome itself as relational totalities . . . ."

Structure, transformation, interaction

A comparable statement is made by Riegel and Rosenwald (1975) in the preface to a book they edit called *Structure and Transformation: Developmental and Historical Aspects:*

"Neither a pure structuralist's approach (which would be comparable to an inspection of the separate frames of a filmstrip) nor a pure transformationalist's approach (which would analyze the flow of movements in the film without any separate inspections of the frames) can lead to satisfactory interpretation of the individual, of society, and their changes. What we should aim to study are structural transformations or transforming structures. These processes are brought about through interactions . . . Interactions are thus the most general concept; but they are also the emptiest of the three."

Identity, endless change, process

In this quotation structuralists can be viewed as focused on classification and identity, transformationalists on endless change, and interactionists on process. The emptiness of the interaction concept results from the fact that this third point of view is still in a process of emergence and does not yet possess any generally accepted formalization.

Introduction to Trialectical Analysis

Holistic viewpoint of trialectics

An axiomatic formulation of the holistic viewpoint has been presented by Ichazo under the name trialectics. Much of this discussion is taken from Horn's (1983) paper in this volume.

In dialectics conflict is the central metaphor. Trialectics replaces this with process. A one-sentence statement of the trialectic point of view might be, "There are no contradictions and no accidents in nature — everything is process, unfolding according to natural law." Here contradiction and accident are used in their technical sense.

Trialectic analysis of Malthus

In the example of Malthusian exponential growth, a trialectical position is that species are the components of unified ecosystems existing in relatively stable states of homeostasis in which, in general, populations are controlled by system dynamics. The conditions under which a species outgrows its food supply and undergoes a population crash are specifiable in terms of certain parameters which are associated to the system — for example, species growth rates and interaction coefficients.

First axiom of trialectics

The axiom of mutation, according to Ichazo, says one material manifestation point (MMP) will mutate into a different MMP.

Material manifestation points are defined by Ichazo as "neutral-points where energy manifests." I have referred to these as relatively stable states. Other terms are being used. Waddington speaks of homeostatic states, while Prigogine refers to dissipative structures.

The implication of this law is that objects of the world, mental events, etc., are not to be viewed as permanent and immutable things, rather they are to be seen as transients which appear, exist in a state of relative stability for some period of time, and then disappear to be replaced by some more or less equally transient phenomena. This conception goes back to Heraclitus, at least, and has been expressed in modern physics by David Bohm (Weber 1982) with his idea of implicate order. Ichazo's axiom includes the explicit statement that MMPs are fixed by natural law and that they can be recognized, classified, and used to establish precise points of reference for more detailed investigation.

Piaget on genetic stable states

This is strongly emphasized by Piaget (1971) in his essay "Biology and Knowledge" where he states, in speaking of the stable development of the concept of species: ". . . the discovery of the laws of heredity has made it possible to demonstrate the existence of 'races' which remain more or less stable until the moment when a new race appears (or disappears) through mutation . . . . The fact would seem . . . to be that there is a series of states of relative equilibrium, of disequilibrium, and re-equilibrium, which admits of classification among the former states, while subordinating the overall system to a relational one, constituted by genetic laws."

"Function" usually inferred

In a series of corollaries to his axiom of mutation, Ichazo emphasizes that the mutation of one MMP to another is to be viewed functionally and that the function is in general not seen directly but must be inferred by empirical and theoretical analysis of the process.

Four components of analysis

This analysis is to be conducted by distinguishing four components of process, called active, attractive, function, and result. The function is interpreted as mediating the flow of energy and/or information from the active to the attractive component of the process, while the result is what is observed as an outcome.

Analysis of contradiction

In one corollary to the axiom of mutation, Ichazo states: "The absence of function provokes contradiction which in turn struggles to find equilibrium that can only be resolved downward." Since function, that is, process, is assumed to be universal, its absence can only occur subjectively. If the subjective observer does not see the functional aspect of a process, he or she will see contradiction. This perception will generate a state of tension leading to attempts to resolve the contradiction, and these attempts will necessarily involve a process of differentiation, resolution downward. It is because dialectical thinkers assume the *real existence* of contradiction in nature that this struggle of continued differentiation is, for them, endless. And thus, Ortega y Gasset's comment that a dialectical analysis should only continue ". . . until one gets tired."

If the super-powers are not able to find a functional way of coexisting, the resulting contradiction could provoke a nuclear war. From a human viewpoint the result of this would certainly be a lower MMP.

Example of analysis: mechanical equivalence of heat

As an example of a trialectical analysis, consider Lord Rumford's discovery of the mechanical equivalent of heat: Rumford observed the process of boring cannon barrels. He noted that the metal of the barrel became hot. From this, after more detailed investigation, he was able to infer the mechanical equivalent of heat. Trialectically, the bore mechanism is "active" — the source of energy for the process. The metal of the cannon barrel is "attractive" — the energy sink, or the recipient of the action. The result is a hot cannon barrel. Rumford inferred the function, namely, that a fixed quantity of mechanical energy was equivalent to a fixed quantity of thermal energy.

There is no requirement that roles be fixed. For example, we could say that the cannon barrels were active in that they conveyed information to Rumford who, in this respect, was attractive, with the function now relating to the particular internal mental processes by which Rumford recognized a significant phenomenon worth investigating.

Importance of levels of description

At this point the best that can be done is to refer to the Polanyi (1969) article on tacit knowledge. This concept can be related to viewing Rumford as the attractive element in the sense that Polanyi would say that recognition of the significance of the hot cannon barrel was possible because Rumford already unconsciously had all the information necessary to conceptualize the mechanical equivalent of heat, and the particular observation simply triggered its emergence into conscious awareness. This and the previous example make it clear that in conducting an analysis of this kind, it is necessary to be very careful about levels of description and analytic depth.

Second axiom of trialectics

The second axiom of trialectics is the axiom of circulation. It says: Within any system, energy and/or information circulate.

Within any closed system, energy is conserved. Making a connection between this and the idea of an MMP as being a "neutral point of retention of energy" shows that in this viewpoint, energy is seen as circulating within a system according to those functional (i.e., dynamic) laws which govern the system, with the result being the MMP of system manifestation.

Second axiom of trialectics (continued)

This is similar to Piaget's conception of structure and function as described by Riegel (1975): ". . . structures emerge through continuous transformational activities; they are, in other words, determined by functions . . . . The individual's development is characterized by shifts in structures brought about by transformational activities."

For the dialectician, however, these transformational activities necessarily invoke conflict. From the trialectical viewpoint, there is simply the circulation of energy and information according to objective natural laws. This is a refinement of the Aristotelian view that "everything occurs in accord with its own nature."

In his corollaries to this axiom, Ichazo states: "From the cosmic viewpoint, opposites do not exist . . . there are no collisions . . . . In nature there are no accidents." (Ichazo 1976, 111)

Third axiom of trialectics

The third axiom of trialectics is the axiom of attraction. It says: One MMP may be attracted to another, either higher or lower in scale.

With this axiom the source of motion, that is, the change of one MMP into another, is attributed to attraction. The emergent MMP, which is potentially existent, becomes attractive with respect to the actual MMP, resulting in a natural motion. Since MMPs are viewed as pre-established rather than accidental, they can be ranked on a value-free scale, and the relative attractions between different MMPs can be computed if the state of the system (i.e., current and all potential MMPs) and its laws of circulation are known.

Criteria for MMPs

The law of attraction states that the mutation of one MMP to another may be either ascending or descending in scale, or if the established scale is only a partial ordering, may be neither. Criteria for establishing a scale of MMPs for any given system are specified with the statement that "Higher MMPs are subject to a smaller number of laws; are more permanent; have less internal movement, greater external range or influence." This can be compared to the Gestalt criteria for a "good form," bearing in mind that Polanyi (1969) uses the Gestalt theory of perception for his basic analogy. Quoting Piaget (1971), ". . . a form of Gestalt gains in significance according to how much 'better' it is in the light of criteria analyzed separately by definite experience. The qualities which make a form 'good' are simplicity, regularity, symmetry, order, closeness of the elements, continuity, and so on."

Introduction to Trialectical Analysis, Continued

Summary of first section

To recapitulate, I have distinguished three different forms of reasoning called formal logic, dialectics, and trialectics, which provide axiomatic formal systems (or viewpoints) for thinking respectively about identity, change, and process.

Next section: three viewpoints in theory construction

In the Horn paper (1983) the focus is primarily on description and the relevance of these different viewpoints for personal action. My intent is to use these different viewpoints to provide a metatheoretic model, essentially a recipe, for theory construction. In order to do this, I will need to consider the different aspects of the scientific process discussed in Royce (1978), Kuhn (1977a), and Polanyi (1969). I will suggest that in tone and emphasis the Royce paper deals primarily on the level of formal logic while the Kuhn paper is primarily dialectical and the Polanyi paper is at least implicitly trialectical. Nevertheless, each paper makes contributions to our understanding in terms of all three forms of reasoning.

Royce's Theory of Theory Construction

Royce's classification

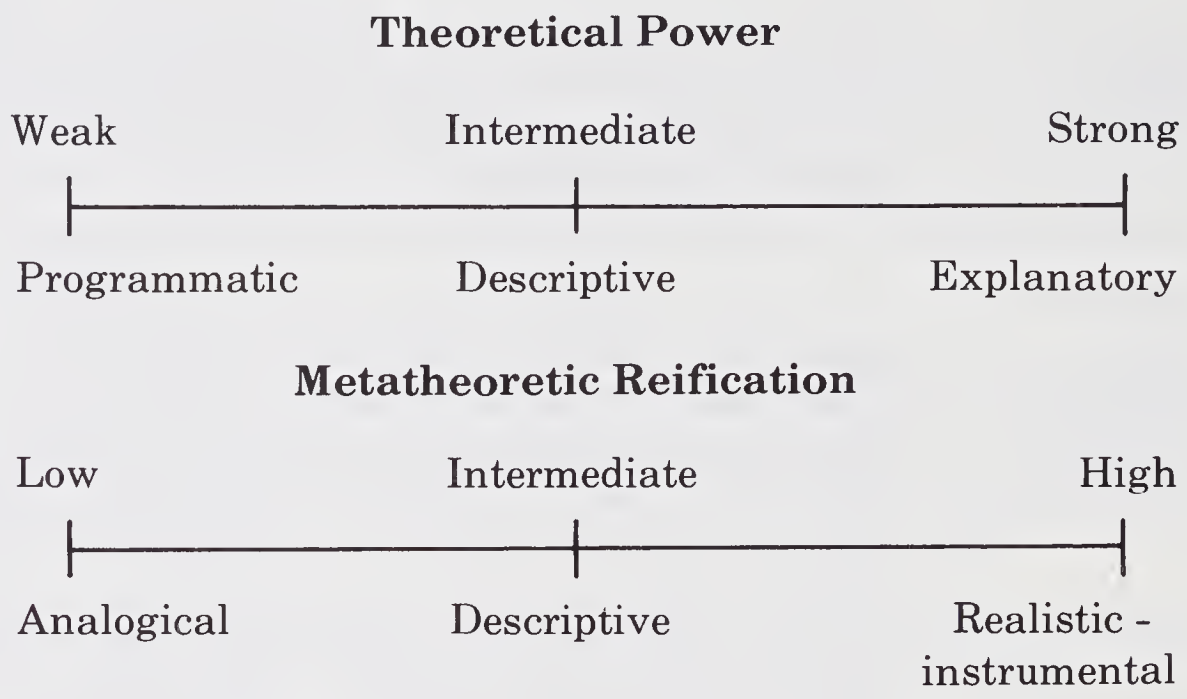
The Royce paper is directed toward providing at least partial answers to the question raised in its title: how to advance theory construction in psychology. The initial premises of the paper, stated at the beginning, are that psychology is primarily an empirical science, is theoretically immature, and that further advances in psychology will require prior advances in theoretical methods; i.e., in techniques of theory construction.

The substantive content of the paper is a hypothesized classification of scientific theories together with suggestions and conclusions arrived at syllogistically from this classification. This is what I mean in saying that the paper is primarily logical in emphasis.

In his Figure 1 reproduced below, Royce presents scales of theoretical power and metatheoretical reification, hypothesizing that programmatic theories are primarily analogical, while descriptive and explanatory theories are realistic or instrumental, depending on philosophic perspective.

Royce's Theory of Theory Construction, Continued

Royce's classification (continued)



Psychology is multi theoretical

Based on this set of distinctions, Royce states: "The major implication of this paper is that the construction of psychological theory will require a variety of strategies, and further, that the optimal strategy for developing a theory of x is dependent upon the degree of maturity of the theory in question."

He notes that the scales of his Figure 1 are most likely continuous and then discusses theory construction strategy for theories at each of the three distinguished points along these scales, indicating that in practice mixed strategies would generally be most appropriate.

The paper concludes with a discussion of conceptual pluralism in psychology. The argument is that every domain of psychology is multi-theoretic and, in view of the enormous complexity of the subject matter of psychology, is likely to remain so for the foreseeable future. Thus, the paper ends with a call for psychology to develop a philosophy which can take the form of a "constructive dialectic" where ". . . the creative production of theoretical alternatives [is regarded] as normal science." The dialectic confrontation of such alternatives will act to weed out weaker theories, resulting in a continuing ferment of constructive — in the sense of generating more possibilities — conflict between the stronger alternatives.

Kuhn's Convergent and Divergent Thought

Tension between convergent and divergent thought

These final recommendations of Royce's, if viewed as recommendations for generating a sound theoretical psychology capable of rapid advance, are in contradiction with the views expressed in the Kuhn paper. Kuhn's title is "The Essential Tension." The thesis he presents is that constructive scientific thinking requires the maintenance of an "essential tension" between what he refers to as convergent and divergent thought, two different modes of thinking which he characterizes as being ". . . inevitably in conflict." This should be sufficient to show the basis of my claim that his paper is written from a dialectical perspective.

Stylistically, too, Kuhn's (1977a) paper is dialectical. There is a sense of pressure, of too little time, of urgency. The dialectical axiom that the potential for change is generated by inevitable conflict is used explicitly: In the discussion of anomalies in a paradigm as the source of change, Kuhn states that in order to generate a paradigm change, an anomaly ". . . must be in explicit and unequivocal conflict with some structurally central tenet of current scientific belief."

Mature science: definition

Kuhn maintains that mature science is characterized by (a) a state of rapid scientific advancement, and (b) the existence of a unifying paradigm which is taught in a rigid and dogmatic manner. Further, that the onset of maturity in a science coincides with the onset of both (a) and (b) which, for Kuhn, are not independent phenomena. Indeed, he holds that the emergence of a unifying paradigm, treated as dogma, is a prerequisite for rapid scientific advance.

Example: physical optics

He mentions the example of physical optics as typical. Prior to Newton, physical optics was in what Kuhn refers to as its divergent phase. There were a plurality of competing theories and the rate of scientific advance was slow. Newton's work introduced a consensus. The paradigm became that of treating light as particles. Suddenly the field began to advance very quickly.

Then the work of Young and others in the late 18th and early 19th centuries led to a paradigm shift. Light was viewed as a wave phenomena. From this came the postulate of the ether, and Maxwell's electrodynamics. With the work of Planck, Einstein, and others in the early part of this century, another paradigm shift occurred, and light is now viewed, following Bohr's principle of complementarity, as having both wave *and* particle aspects.

Kuhn's Convergent and Divergent Thought, Continued

Conflict between Royce and Kuhn

The conflict between Kuhn and Royce's comments on conceptual pluralism should be obvious. Royce suggests that psychology may achieve theoretical maturity by adopting a philosophy of constructive dialectics, which explicitly recognizes and endorses conceptual pluralism.

Kuhn maintains from an ostensibly dialectic position, and with historical evidence, that conceptual pluralism is in fact characteristic only of the early and immature phase of a science's evolution.

Both partially in error

I argue that both positions are partially in error. Royce is correct in his association of dialectical thought with conceptual pluralism rather than what might be called paradigmatic unity, but errs in suggesting that this can be taken as a sign of theoretical maturity. Kuhn is correct in his association of paradigmatic unity with mature science, but errs, at least implicitly, in his choice of a dialectical perspective for analysis.

Polanyi: Tacit Knowledge and Gestalts

Tacit knowledge

Now I want to turn to the Polanyi (1969) paper, which is devoted to discussion of his concept of tacit knowledge. In brief, Polanyi's argument is that in the end every scientist must base his scientific conclusions on his own personal judgment, on his scientific intuition. This intuition can be compared by analogy to Gestalt phenomena in perception. That is, it resembles the perceptual distinction of figures from a more or less random background and depends on the presence of only dimly recognized clues which hover at the edges of awareness.

Key idea: emergence of unified patterns

It is not so clear that this paper is trialectical in emphasis, and it is so to a lesser degree than the Royce paper is logical or the Kuhn paper dialectical. The telling point is the emphasis on the phenomenon of emergence. Although hindered by the lack of an explicit axiomatic form to guide his thought, Polanyi deals with the idea of the emergence of unified patterns.

Polanyi: Tacit Knowledge and Gestalts, Continued

Science as problem or puzzle

The Polanyi and Kuhn arguments can be easily synthesized if we recognize that when Polanyi speaks of *science* as contrasted to *surveying*, he is speaking of Kuhn's distinction between revolutionary and normal science.

Kuhn (1977b) deals with this in a paper, "Logic of Discovery or Psychology of Research," in which he contrasts his views with those of Sir Karl Popper. After indicating the intellectual debt which he owes Popper and describing the many points on which he feels they are in agreement, Kuhn states:

"It is important to notice that when I describe the scientist as a puzzle solver and Sir Karl describes him as a problem solver the similarity of our terms disguises a fundamental divergence. Sir Karl writes (the italics are his) 'Admittedly, our expectations, and thus our theories, may precede, historically, even our problems. *Yet science starts only with problems*. Problems crop up especially when we are disappointed in our expectations, or when our theories involve us in difficulties, in contradictions.' I use the term 'puzzle' in order to emphasize that the difficulties which *ordinarily* confront even the very best scientists are, like crossword puzzles or chess puzzles, challenges only to his ingenuity. He is in difficulty, not current theory."

Polanyi and Kuhn contrasted

When Polanyi speaks of *science* as dealing with *problems* he does so in a Popperian sense. What Polanyi rather disparagingly calls surveying, Kuhn would call puzzle solving. In this latter case — which does not excite Polanyi's interest — scientific intuition will function in a secondary way only. The scientist will seek to recognize the solution of his puzzle against the fixed background of a given paradigm. As Kuhn emphasizes, this is more a matter of ingenuity than intuition.

What does interest Polanyi is what Kuhn calls paradigm shifts, where, in Polanyi's metaphor, both figure and ground change: where persistent anomaly acts as the cue which triggers a complete reorganization of the background paradigm against which anomaly appears.

Synthesis of Polanyi and Kuhn

With this synthesis, Polanyi's ideas can be seen as supporting Kuhn's arguments concerning the rate of scientific advance in pre-and post-paradigm sciences. It is the presence of a unified paradigm which provides the background for precisely those persistent anomalies which can act as catalyst for paradigm shift. In the divergent phase of a science's evolution, there is no fixed background against which anomaly can be sharply distinguished.

Polanyi: Tacit Knowledge and Gestalts, Continued

Synthesis of Polanyi and Kuhn (continued)

Making a brief and oversimplified synthesis, we can distinguish varying levels of theoretical power: programmatic, descriptive, and explanatory, correlated with increasing degrees of metatheoretic reification.

The early phases in the evolution of a science are characterized by conceptual pluralism and a consequent slow rate of scientific advance. One might expect a preponderance of programmatic theories in these phases.

At some point a unifying paradigm emerges and the science, as it were, takes off. Neither logic nor dialectics can provide a perspective which comprehends this phenomena. It remains to be shown that trialectics does. Before proceeding to this point, however, I will address the specific question of theory construction.

Royce's Three Types of Theory

Programmatic, descriptive, and explanatory theory

As mentioned earlier, Royce considers the issue of what might be optimal theory construction strategies for each of the three classes of theories he distinguishes. Summarizing his discussion, these are:

"Identification of the relevant theoretical constructs and ascertain their theoretical relationships. Generation of reliable empirical laws, development of a viable taxonomy, and an inventory of generalizations." At this point the theory is only heuristic and as such cannot be subjected to severe critical analysis. That is, we cannot demand much of the theory except that it provides a consistent direction for continued research.

". . . What is crucial is to establish a network of relationships and a body of generalizations and principles. This means that descriptive theory must become more abstract . . .

"Optimality of strategy in this case involves developing a tight nomological network while minimizing relatively weak connections."

"Weeding Out" theories

This implies that the transition from programmatic to descriptive theory must involve a process of weeding out of those theories which are not able to satisfy the more stringent criteria of acceptability imposed on descriptive theories. As discussed by Royce, this weeding out process can occur through a (constructive) dialectic in which rival programmatic theories would compete in an atmosphere of constructive criticism. This could exemplify what Kuhn refers to as the divergent phase of a science.

Royce's Three Types of Theory, Continued

"Weeding Out" theories (continued)

". . . The relevant strategy for explanatory theory is to press for the limits of its applicability. However, the issue of theoretical scope also raises the question of parsimony . . . stating the theory via the smallest possible set of constructs, principles, and axioms." Explanatory theories are characterized by "rigorous formalism, highly replicable empiricism, and . . . broad scope." (Royce, 1978)

Explanatory theory: a paradigm

In fact, explanatory theory might well be expected to hold the status of paradigm. A distinction can be made, however. A paradigm is an overall viewpoint which particular theories may embody. The charisma of a successful explanatory theory makes the associated paradigm attractive as a viewpoint from which other theories may be constructed.

From Kuhn's perspective, then, there are two kinds of theory in the divergent phase of a science — programmatic and descriptive. There is one — explanatory — in the paradigmatic phase. This is also consistent with the primary relevance of Polanyi's tacit knowledge to paradigm changes in a science, since good scientific intuition is nothing but receptivity to an alternate explanation of anomalous phenomena, whereas ingenuity is the ability to fit such phenomena to the given paradigm.

Parallel from Piaget

In the programmatic and descriptive phases of theorizing, there will be many competing theories vying for acceptance. The different stages of theory construction distinguished by Royce can clearly be seen in the following quote from Piaget (1971), which also indicates their positions as being primarily logical (classificatory), dialectical (differentiating), and trialectical (holistic).

Piaget, in concluding his discussion of the notion of a biological species, states: "To sum up, having first entertained a realist notion of species, and then an atomistic and nominalist one, biology today is turning toward a relational study of functional totalities in the framework of which the species is seen in nature, which leads one to believe in the primacy of the notions of equilibration and regulation by virtue of the fact that, conceptually, they go far beyond the antitheses originally presented."

The antithesis Piaget is referring to was the seeming contradiction between the concepts of genotype and phenotype which characterized the later part of the "atomistic" stage of development of the species concept.

Royce's Three Types of Theory, Continued

Parallel from Kuhn

This quote can be compared to Kuhn's (1977a) example of the evolution of physical optics. It gives an example of the progression from programmatic to descriptive to explanatory theory, and illustrates the particular relevance of each of the logical, dialectical, and trialectical viewpoints as they might apply in the different stages of theory construction.

Logical Method

Injunctive version of axioms possible

At this point, then, it becomes necessary to inquire more deeply into the forms of reasoning important in these different stages of theory construction. (I realize we may be talking about a more or less continuous evolution. The term "stage" is used here only as an abbreviation.) To begin, the axiomatic statements of the three forms of reasoning can be rewritten in the injunctive mode, giving three methods for rational analysis of any given phenomena or system. (See Caswell [1983] for another injunctive formulation of these axioms.)

Procedure for logical method

The procedure for logical method may be stated as follows:

STEP	ACTION
1	Identify natural system components and states for the given analytic goals. The way to make such identifications has been known at least since Plato.
2	Determine all relevant distinctions between system components and states. This can be done by contrasting different components pairwise.
3	Arrange results into a system taxonomy, that is, a partially ordered set with the partial ordering specified by the empirically determined nature of the distinctions between the several system components and states.

These three methodological rules involve respectively the three ways in which a set may be described, namely, enumeration, description, and abstract indication. The result of applying this method will be taxonomies of system states and components. Under some circumstances these taxonomies can be taken as isomorphic.

Dialectical Method

Major confusion in dialectics

My previous discussion of dialectics was from a critical viewpoint. The reason for this is that the dialectical method has been the subject of all manner of fantastic claims made by people who fail to understand the distinction between an apperceptive consciousness, the rules of information processing utilized by that consciousness for the organization of sensation, *and* the ultimate source of those sensations.

Procedure for dialectical method

The procedure for dialectic method may be stated as follows:

STEP	ACTION
1	For each state of the system in question determine the allowed variance of system parameters. This is how much quantitative change in parameters is allowed before there is a qualitative change of system state. In the natural sciences this is the method of independent variation of parameters. For highly complex systems it is likely to require sophisticated statistical techniques.
2	Determine pairs of system parameters which are correlated when the system is operating in any given state. As a heuristic assumption, such parameters can be assumed related by constraint equations. Homeostatic forces can be estimated by determining related rates of parameter changes for correlated parameters. This technique is used in physics, for example, where the idea of a virtual displacement is used to compute equations of motion.
3	Describe changes in any given system state in terms of an equilibration between forces tending to drive parameter values outside the range of stability of the state and homeostatic forces which tend to keep parameter values within the stable range.

This set of methodological prescriptions provides a detailed synchronic analysis of system operation. I realize, of course, that as stated it is highly simplistic and requires far more detailed elaboration. It also requires precise taxonomies as constructed via the logical method and information about change of state. Again, it is necessary to emphasize that any actual application of these methods will necessarily involve the simultaneous use of all three. After discussing the trialectical method I will present an illustrative example.

Historical notes: consistency of Hegel's metaphysics

The historical root of this confusion lies in Aristotle's law of contradiction and the fact that for almost two thousand years Aristotle's logic was the only form of reasoning invariant across both individual personalities and cultures. As such, it was the only form of thought which could be universally trusted as an impartial mediator of human communication. Because of this, the laws of logical thought were projected onto the world and it became dogma that the world *was* logical. Logical paradoxes of motion devised by Zeno of Elea were generally interpreted by Aristotle, Thomas Aquinas, and others as implying a prime cause or first mover.

This became Hegel's Absolute Ideal. Hegel's argument was, as Monod (1972) rightly indicates, appropriate for Hegel, since, as an idealist, he was committed to belief in the primacy of mind. Thus, identifying motion as necessarily implying a contradiction in logic had no ill consequence for Hegel because, as is emphasized by Boring (1933), mind can be viewed as originating with distinction, and this involves the law of contradiction. Thus, if mind operates on contradiction, and if mental processes involve the continual resolution of contradictions, and, if mind is all there is, then Hegelian dialectics follows.

"Animist projection" in dialectical materialism

The dialectical materialists, however, erred in projecting this strictly mental view onto the material world, arguing that mind arises out of matter and therefore the laws of thought must be the laws of nature. Monod states "... to make dialectical contradiction the 'fundamental law' of all movement, all evolution, is to try to systematize a subjective interpretation of nature ... This is 'animist projection' again, always recognizable whatever its disguises."

Refine dialectics for rational theory

My earlier criticism of dialectics was only for the purpose of reducing it to its rightful place as the rational viewpoint for discourse on synchronic aspects of change. Thus, in my discussion of the dialectical method, I will modify some of the standard language in order to eliminate the ideas of unlimited quantitative change and conflict.

People interested in a discussion of the dialectical method along standard lines are referred to Wozniak's paper in Riegel and Rosenwald (1975). Note, also, that many modern dialecticians are beginning to recognize the inappropriateness of the unlimited growth and conflict metaphors.

Trialectical Method

Procedure for trialectical method

The procedure for trialectic analysis may be stated as follows:

STEP	ACTION
1	At the desired level of analysis, identify the system states, or MMPs. If possible, obtain a state transition matrix which gives, for each pair of system states, the probability that if the system is in one member of the pair, it will make a transition to the other. These probabilities will generally be time dependent. They may also depend on environmental conditions if the system is an open system.
2	Determine laws governing the exchange of energy and information between system components and the way in which these laws map onto the matrix of state transitions. That is, what quantities of what kinds of energy and/or information are exchanged in the various state transitions?
3	Establish a partial ordering of system states and construct a model (mathematical) for the attraction between different system states as a function of system parameter values and boundary conditions.

The combination of these three provides a system dynamics which explains the observed state transition matrix (or, for continuous systems, the state rate of change) in terms of relative stabilities of states (these can be used to establish the partial ordering of system states, or MMPs) and the dynamics of energy and information exchange between system components.

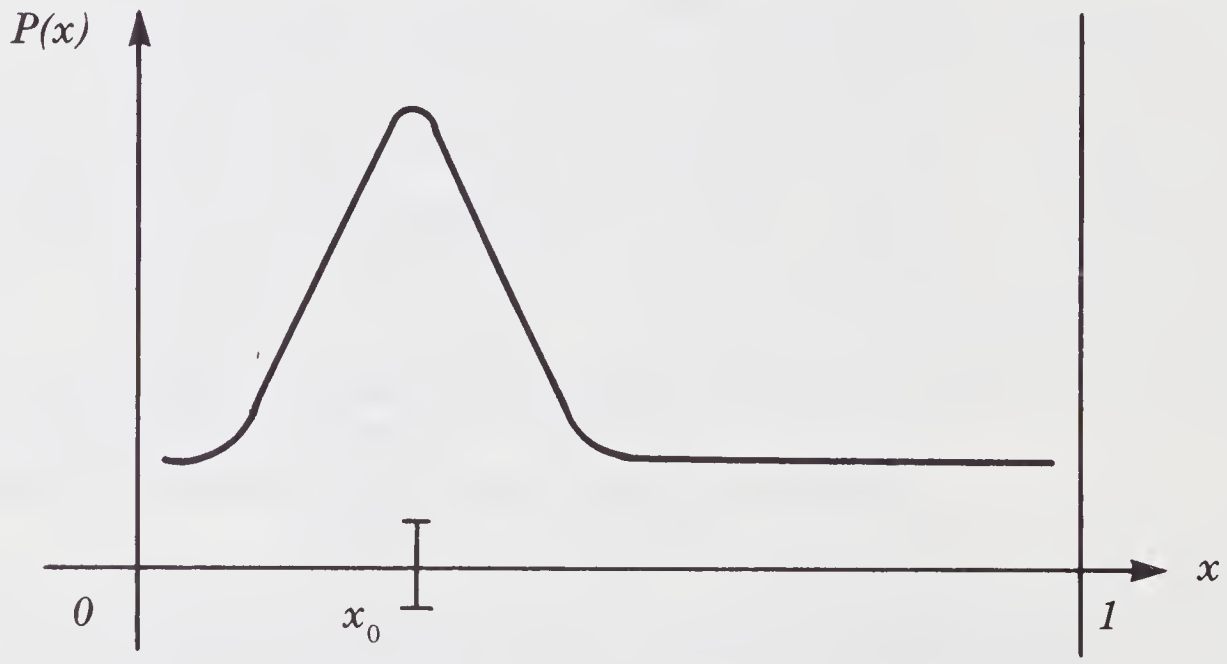
These three methods not new

These three analytic methods I am proposing are, in a programmatic and descriptive sense, far from new, even in psychology. Titchener, for example, in 1898, writes: "We may enquire into the structure of an organism, without regard to function — by analysis determining its component parts, and by synthesis exhibiting the mode of its formation from the parts. Or we may enquire into the function of the various structures which our analysis has revealed, and into the manner of their interrelation as functional organs. Or, again, we may enquire into the changes of form and function that accompany the persistence of the organism in time." In biology Titchener equates these concerns with systematics, ecology, and evolution, respectively.

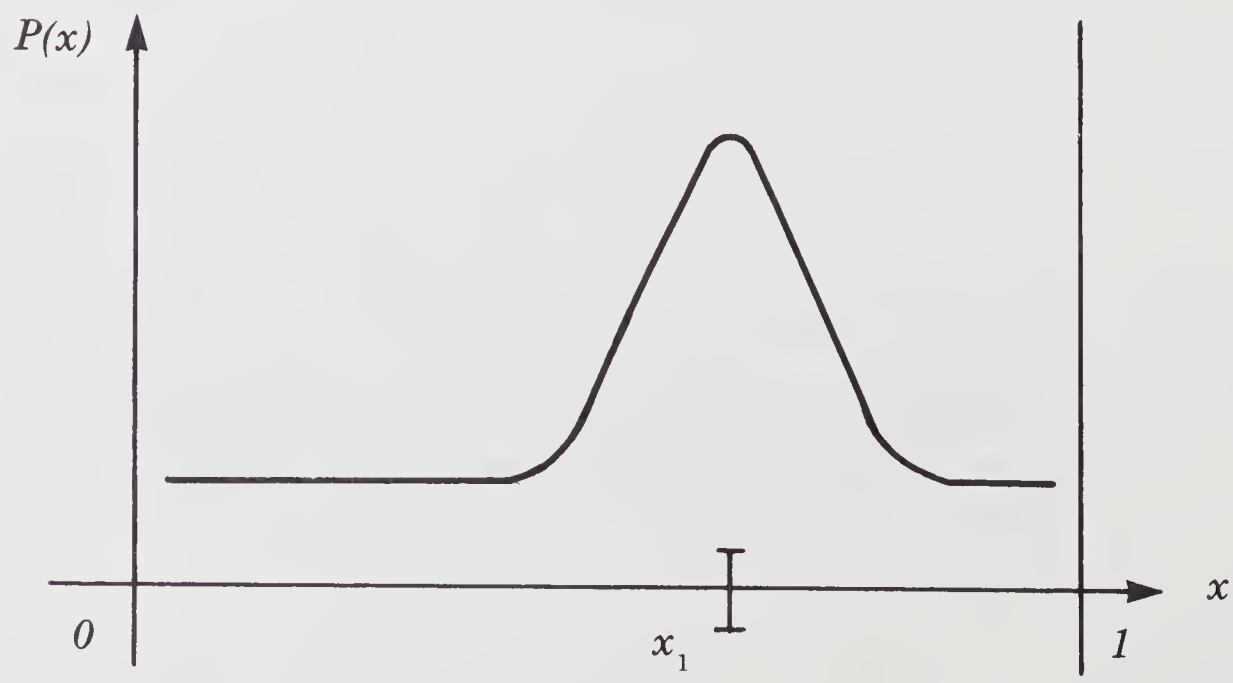
Example of Analysis in Genetics

Example: genetics

A simple genetic example will illustrate the different aspects of a phenomena addressed by dialectics and trialectics. Consider two alleles, say A and a, at a single genetic locus in some population. If the frequency of a's occurrence in the population is x then the frequency of A's occurrence is $1\text{-}x$. Suppose that the population is subject to selection — determined, for example, by the concentration of some chemical, C, in the environment, such that if the concentration is less than some critical C_0 the probability $P(x)$ of finding a mean frequency x in a sample population looks like



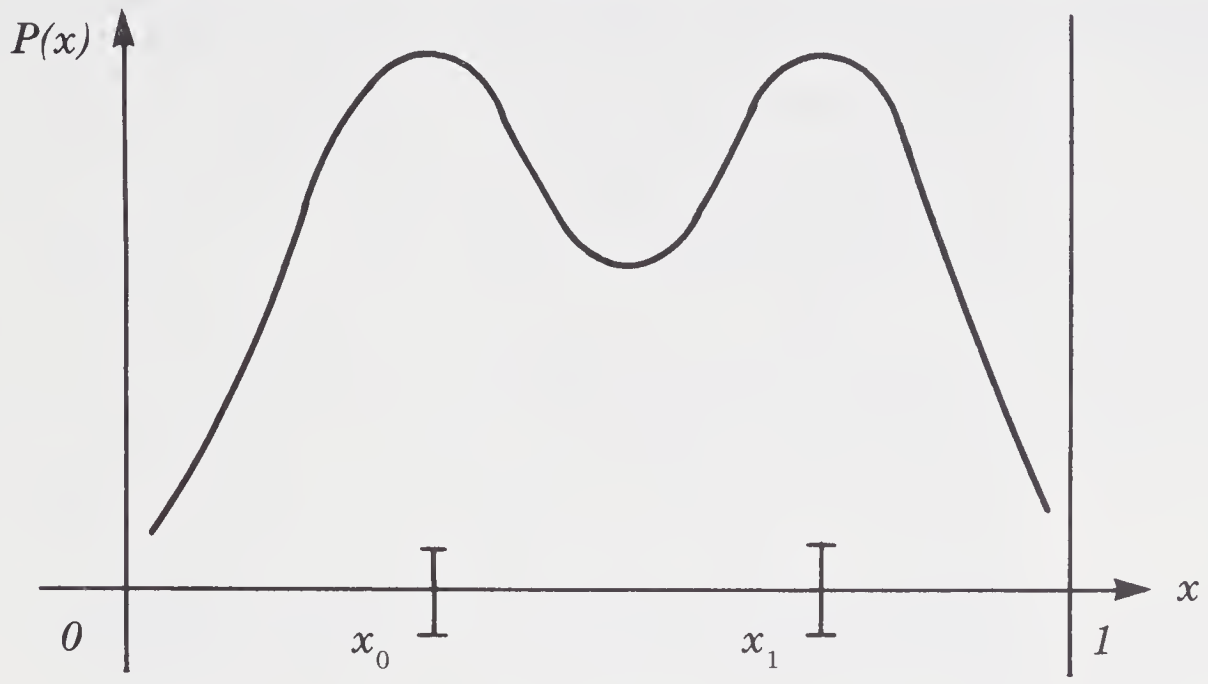
while for concentrations greater than some $C_1 > C_0$ this probability is given by



Example of Analysis in Genetics, Continued

Example: genetics (continued)

and for concentrations between C_0 and C_1 it is



Dialectical analysis

For each MMP a dialectical analysis following the methodological rules I have stated begins by determining the values of C_0 and C_1. The two significant forces acting on the observed distributions are *selection* and *genetic drift*. The relevant parameters are thus the selection coefficient, or equivalently for this example, the observed concentration of C, and the drift coefficient which is a diffusion parameter. In any of the equilibrium states, these two forces are opposed. Selection acts to concentrate the distribution about the exact equilibrium value while drift acts to produce a uniform distribution over the entire range. Consideration of genetic details of the "conflict" of these two forces leads to an at least heuristic derivation of the Wright-Fisher equation for genetic drift with selection. Stationary solutions of this equation describe equilibrium distributions.

Trialectical analysis

For a trialectical analysis, the MMPs are the three possible equilibrium distributions. The dynamics of transitions from one MMP to another involve being able to specify the concentration of the chemical C as a function of time. It might be, for example, that this concentration could be described by some form of differential equation which would allow application of Thom's (1975) catastrophe theory. Finally, the attraction between different MMPs can be roughly determined. Suppose that up until some time t_0 $C<C_0$ while for $t>t_0$, $C>C_1$. Then a transition from the x_0 distribution to the x_1 distribution will occur at about t_0. During this transition period we would say that the latter MMP was *attractive* with respect to the former. A quantitative measure of the degree of attraction could be obtained by recognizing that during the transition, selection and drift are acting in cooperation rather than in opposition, and thus estimating the degree of attraction in terms of the selection and drift parameters.

Summary of Theory Construction

Three methods and Royce's typology

Returning to the direct issue of theory construction, the question now becomes how these three rational methods apply in the different phases of theory construction distinguished by Royce. It would be nice to make a one-to-one correspondence in which logic related to programmatic theory, dialectics to descriptive theory, and trialectics to explanatory theory, and at some levels this is possible.

For example, the prime concern of programmatic theory construction, as identified by Royce, is development of an adequate classification scheme, and this is a question of identity and hence of formal logic. Likewise, development of a sound nomological net with minimization of weak connections, the prime concern for descriptive theory, involves a more dialectical perspective in which different candidates for inclusion in the net are selected on a competitive basis and the theory itself is subjected to intense criticism.

Finally, explanatory theory takes the role of unified paradigm and this involves a more trialectical perspective.

All three forms of reasoning necessary in each phase

It should be clear, however, that all three forms of reasoning are necessary in each phase of the evolution of a science. In building a taxonomy, it is often useful to make distinctions between different potential taxonometric possibilities by viewing the various possibilities as competitors — obviously engaged in a life or death struggle. And even at this early stage an at least intuitive feel for the innate potentiality of competing taxonometric hypotheses in terms of their eventual explanatory power is, following Polanyi, necessary. That is, it is desirable for the taxonomy to be as *natural* as possible if it is to serve as the basis of an eventual unified theory.

Similarly, descriptive theory still involves taxonometric considerations, although from a viewpoint which involves the descriptive more than the enumerative definition of the set theoretic substructure of the taxonomy. Quoting from the beginning of this paper: "... a taxonomy is solidified by redefining it in terms of theoretical principles induced from the data which suggested its original definition."

And again, an eye must be kept open to the desire for eventual explanatory theory. In explanatory theory the taxonomy defines an abstract mathematical space on which logical and mathematical operations describe the structure of the theory,while a dialectic approach serves to generalize the theoretical structure.

Summary of Theory Construction, Continued

Summary of paper

I recognize that the points I have discussed require a great deal of further elaboration and also fixation by presentation of details of specific examples. At this point, however, I will only summarize what I have said, and then consider a single example.

Beginning with a general discussion of reason as a means of viewing the world, I distinguished three forms of reasoning called formal logic, dialectics, and trialectics. These were discussed in turn in axiomatic form. Formal logic was described as providing a rational viewpoint for questions of classification and identity; dialectics, for a synchronic view of change; and trialectics, for a diachronic view of change and emergence.

At this point the Royce, Kuhn, and Polanyi papers were introduced. The Royce paper provided a classification of different phases in the process of theory construction. The Kuhn paper provides a synchronic view of the operation of this process and contains the historical example of physical optics, which I will momentarily consider.

The Polanyi paper discusses by analogy the phenomena whereby a trained scientist is able to perceive new patterns against the background of an established paradigm with the result that the background paradigm changes. Polanyi compares this to the phenomenon of perceptual reorganization studied in Gestalt psychology.

With this background the three forms of reasoning discussed are used to generate three rational methods for theory construction. These methods are examined as they relate to the structure and dynamics of the evolution of scientific theory, as presented in a synthesis of the Royce, Kuhn, and Polanyi statements. I would argue that these three forms of reasoning and the corresponding analytic methods are jointly necessary and sufficient for construction of scientific theory.

Example of Physical Optics

Example: divergent phase in optics

I will conclude with a brief discussion of the history of physical optics as alluded to by Kuhn. His claim is that this is paradigmatic for the evolution of every science. The observed structure of this evolution corresponds to the phenomonological description of the evolution of life presented by Teilhard de Chardin (1959) in his work *The Phenomenon of Man*. In addition, Parsons (1966) has pointed out that *social* evolution can be seen as occurring in three phases which he calls primitive, ancient, and modern, and whereas there is tremendous variation in the forms of primitive and ancient societies, *every modern society is based on the same underlying pattern* — that which evolved in Western Europe. Thus Kuhn's example is one of great generality.

Historically, from the time of Aristotle to that of Newton, physical optics was in what Kuhn refers to as its divergent phase, what Royce would call a state of conceptual pluralism. Kuhn points out that this state was characterized by a variety of competing theories, no established paradigm, and that physical optics during this phase was a relatively static science.

Example: unified paradigm in optics

With the publication of Newton's *Optiks* this changed. A unified paradigm appeared in which light was viewed as consisting of particles, and physical optics, as a science, suddenly began to advance at an almost explosive rate.

Example: paradigm shifts

Later, around 1800, a paradigm shift occurs and light comes to be viewed as a wave phenomena. The rapid state of advance is maintained, however, culminating in Maxwell's electrodynamics. Subsequent to this, another paradigm shift occurred with light being ascribed properties of both waves *and* particles. This is the current paradigm. Again, rapid scientific advance has continued with such things as quantum electrodynamics, photoelectric devices, and non-linear optics.

Logic cannot explain these changes

This historical evolution cannot be explained logically since logic does not deal with change. What logic does permit is the distinction of the different stages in this evolution, each stage being characterized by a single property — the paradigmatic status of physical optics during the stage. Logic says nothing, however, about the points of paradigm change.

Example of Physical Optics, Continued

Dialectic analysis of change (in optics)

From a dialectic perspective Kuhn gives a synchronic description of the process of change. In this view a continued increase in the quantity of unexplained anomalies will eventually lead to a change of paradigm. The potential for such change comes from the tension generated in a scientific community by the conflict of anomaly and current paradigm. The new paradigm will synthesize anomalies and the old paradigm at a new level of theoretical integration. The occurrence of anomaly, and the consequent appearance of a new paradigm are accidental.

Trialectic analysis of process (in optics)

Finally, trialectical analysis gives a unified diachronic view of the entire process. What is attractive is a deeper understanding of physical optics. The active component of the process is a community of scientists, which does not exist as a unified community prior to the beginning of the paradigmatic phase of the science. The functional element is the normal process of doing science, the puzzle solving to which Kuhn refers. And the result is the advancement of physical optics as a science.

The different paradigmatic states of the science are the MMPs of the process, and the law of circulation in this case involves the interchange of information between individual scientists within the general scientific community. Thus it relates to availability of journals, scientific education, and the diffusion of ideas.

There is a clear functional distinction between the divergent and paradigmatic stages of the science. In the divergent stage there is no unified scientific community and the activity of individual scientists is directed more toward competition with other scientists. This is perhaps because reputations will be determined by the relative prestige of theories espoused and, as Kuhn notes, there is a natural reluctance to make too strong a commitment to only one of a number of competing theories.

In the paradigmatic stage on the other hand, there is a single universally acknowledged theory which commands commitment on pain of expulsion from the scientific community, and reputations depend on how well one is able to solve the "puzzles" which this theory presents.

Notes

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Chapter 4
Dialectics and Trialectics: A Comparison of Two Analyses of Change

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Introduction

The concept of change

Change is so characteristic of our time that we tend to take it for granted. This cultural acceptance of change is relatively recent, although the conception of a world that is ceaselessly changing is not itself new. The Greek philosophers argued the question of permanence and change, but permanence dominated their theory of reality. Permanence remained the dominant conception in Western thought for the next thousand years.

Before the great explorations of the 16th century and the scientific investigations of the 17th, philosophy was a matter of eternal truths, heaven and earth were believed to be fixed as created, and the structure of society was ordained. The contrast with our own time is evident.

Investigation of change

Change intensified with the Industrial Revolution and the population growth of the 19th century. At the same time, an active and investigative approach to the past became a new intellectual standard. Darwin explained the mechanism of biological change. Geologists found that the record of the past was preserved in the present. Researchers analyzed documents (beginning with the Bible) for historical fact rather than accepting their historicity on the basis of doctrine. Marx researched the material basis and historical development of economic forms. In philosophy, at the beginning of the century, Hegel described reality itself as an evolving process.

Purpose of this paper

Our purpose in this paper is to compare two analyses of change: the dialectical explanation that was developed by Hegel early in the 19th century and reshaped as dialectical materialism; and the alternative explanation mentioned below, the trialectical logic proposed by Oscar Ichazo.

Logic and Change

Dialectics: change as conflictual

In the 19th century's search for underlying principles of natural and social change, Darwin found competition, Hegel found dialectics, and Marx found the economic basis of class conflict. Physical and social change were understood as conflictual by Darwin, Hegel, and Marx.

Trialectics: change as process of attraction

Oscar Ichazo (1976, 1982, Arica 1982), in proposing an alternative explanation of change, ascribes the perception of fundamental, ubiquitous conflict to dialectical logic. (See Horn [1983] in this volume.) His alternative, trialectical logic, rejects conflict as the mechanism of change, and describes change as a process of attraction.

Influence of dialectical thought

In dialectical materialism the concept of struggle and confrontation as a necessary preliminary to change was applied as a general principle to all phenomena. This concept became part of the theoretical basis of Communism. The influence of the dialectical outlook reaches still further, according to Ichazo (1982, 43-45, 60, 91; Arica 1982, 36), who contends that dialectical thought permeates Western culture as much as it does Soviet politics: We categorize and see things as antagonistic opposites; our model for action is competition.

In Ichazo's view, the conflictual — or in his terms, dialectical — model is favored in the attempt to deal with new problems of change just as it is favored in accepted descriptions of change that is past. Although Ichazo is critical of the dialectical model, he credits Hegelian dialectics (1982) with providing a new understanding of change by reformulating the three laws of traditional logic. And Ichazo proposes a new logic which again takes its starting point from those three laws.

Different logics for permanence and change

Ichazo (1982) describes three categories of emphasis which shape logic. Within each one the three traditional "laws of thought" are reinterpreted. They have historical correspondences which are outlined below.

1) *Formal (traditional) logic*
   Emphasis on identity and permanence
   Ancient Greece until the Renaissance

2) *Dialectical logic*
   Emphasis on contradiction and change
   17th century science, 18th century Enlightenment,
   19th century philosophy, Industrial Revolution,
   World Wars I & II.

Logic and Change, Continued

Different logics for permanence and change (continued)

3) *Trialectical logic*
Emphasis on cycles (change and permanence conjoined)
The present time, acceleration of change, information explosion, reaching the limits of the planet

According to trialectical theory, each historical period exemplifies one type of logic, but all three are always present in some form. This is necessarily so since neither individuals nor society can function without a concept of identity, without adapting to change, and without anticipating cycles of recurrence.

This scheme of the development of logic is reminiscent of Hegel, but in denying that contradiction is the "motor of change" (a basic concept shared by Hegel and almost all dialectical materialists), Ichazo parts company with the dialectical model.

Comparing Dialectics and Trialectics

Dialectics and trialectics in this paper

Dialectical theory, in this paper, is the theory as it came to be understood through Marx's use of Hegel's method of analysis, through Engels' popularization of Marx, and through subsequent development by Lenin and contemporary Marxists, both Soviet and non-Soviet.

We refer to trialectical theory mainly as presented by its author, Oscar Ichazo, in two books, *The Human Process for Enlightenment and Freedom* (1976), and *Between Metaphysics and Protoanalysis: A Theory for Analyzing the Human Psyche* (1982), and also as given in instructional materials prepared by Ichazo's students.

Reason for comparison

Trialectics is the successor to dialectics in Ichazo's schema, and both logics are described by him as designed to deal with change (as compared with formal logic). Real and apparent similarities between dialectics and trialectics led us to make a close comparison of the two. While the two logics will at first seem similar because they share an emphasis on change, they diverge from each other concerning why change occurs and how it takes place.

Comparing Dialectics and Trialectics, Continued

Similarities between dialectics and trialectics

The two theories share several fundamental assumptions and assertions:

- Everything is in movement.
- Everything has internal polarity.
- Movement in social process and movement in nature are comparable.

As simple as these statements are, they depart from the assumptions of traditional logic.

Differences between dialectics and trialectics

Stated briefly, the essential differences between dialectics and trialectics may be found in:

- The concept of contradiction, implicit and explicit, in both logics.
- The theories of the nature of physical reality in both logics.
- The trialectical concept of pre-established MMPs (material manifestation points), which has no exact counterpart in dialectics, but which may be compared with the dialectical concept of nodal points.
- The trialectical concept of attraction, which may be contrasted with the dialectical concept of struggle and negation.

The comparison of similar and different concepts in dialectics and trialectics touches issues in a long-standing debate involving science and philosophy: In general, by what principles of reason can we accurately describe our surrounding reality; and in particular, can contradiction exist as anything but a possibility held in thought. These larger issues are not the subject of this paper, which is simply a comparative analysis of written materal, but they are a part of its wider context.

Outline of this paper

Part 1 reviews the core concept of dialectics — contradiction — and opens the question of whether trialectics differs from dialectics on this point.

Part 2 briefly compares dialectical and trialectical theories of the nature of physical reality.

Part 3, the main body of the paper, is an axiom by axiom comparison of dialectics and trialectics which examines the similarities and differences listed above.

Part 4 gives a summary and conclusions.

Part I
Dialectics, Trialectics, and Contradiction

Introduction

Contradiction and change

Trialectics and dialectics are both presented as logics for change, and distinguished from formal logic by that emphasis. In this section we introduce the question of whether contradiction, the main point of the dialectical departure from formal logic, is also a feature of trialectics. We focus on contradiction in dialectics, review its implications, and prepare the way for the discussion of contradiction in trialectics in Part 3.

Contradiction the core of dialectics

Contradiction is the core of dialectics. [1] The essential element of dialectical theory is that change comes out of the struggle of inherently contradictory opposites.

Contradiction and science

The dialectical theory that there is contradiction in reality is rejected by most Western scientists. In dialectics, since there is contradiction in real processes, a statement describing process may seem self-contradictory. This is regarded by critics as irrational because it violates the logical principle of non-contradiction: A statement cannot be, at the same time, both true and not true. Applied to reality, this principle is understood to mean that a thing cannot be, at the same time, both itself and not itself. Otherwise, it is argued, all reference points for reasoning are lost, and no science or consistency is possible.

Is there contradiction in trialectics?

Ichazo criticizes the dialectical viewpoint that contradiction, or conflict, is necessary for change. However, Ichazo's axiom of mutation refers to "contradiction" as preliminary to a change to an "inferior" state.

The concept of contradiction in trialectics thus requires scrutiny. If trialectics assumes the presence of contradiction in physical processes, it is, on the face of it, not a logic acceptable to Western science. We will argue (in Part 3) that contradiction in dialectics is not the same as contradiction in trialectics, and that trialectics does not accept the presence of contradiction in physical processes.

Development of the Concept of Contradiction

Contradiction before Hegel applied only to mind

The notion of a dialectic of opposing elements goes back to ancient Greece. But until Hegel, contradiction was thought of as something that occurred in the mind, but not as a force in things per se. (The philosophy of Heraclitus briefly provided an exception.)

Hegel: All reality is contradiction

In Hegelian dialectics, *all* of reality is a process of contradiction producing change. Everything is a unity of contradictory opposites in which one opposite must supersede the other. The superseding opposite cancels (negates) the other, and at the same time absorbs it, and itself changes. The outcome is a third element that is not simply a combination of the previous two, but a new thing in itself, although conditioned by what went before it.

In Hegel's dialectic, the opposites of reality and mind negate and absorb each other, and, over time, incorporate each other. Reality and mind are then one process. This means that contradiction operates in physical processes (reality) as well as in intellectual and social ones (mind).

Laws of dialectics come out of Hegel

Hegel's philosophy dominated European academic thought in his own lifetime and during the following generation, when Marx was a university student. Among the ideas that Marx and other dialectical thinkers took from Hegel are quality and quantity, unity of opposites, contradiction, and negation. Engels developed these ideas as the laws of dialectics.

Doctrinal dialectics

Marx applied Hegel's concept of inherent contradiction leading to change to a historical analysis of economic development. Yet, while Marx analyzed contradictions, he had little to say about contradiction itself. In the Communist attempt to build a body of theory around the writings of Marx, there has had to be a lot of reading between the lines.

The interpretations of Marx by Engels and Lenin provide the main doctrinal support for the "real" existence of contradiction. [2]

The Critique of Contradiction

Alternative dialectics offers relevance

Since much of Marx's early writings [3] did not become available in Russian and German until 50 years after his death, and in English not until 80 years after his death (or 20 years ago), there is continuing study of Marx's thought and a growing body of neo-Marxist interpretation.

The movement toward a new interpretation of Marx is an effort by radical thinkers to provide an alternative analysis of social and scientific problems by putting aside the dogmatism that makes Marxist thought suspect to Western science. Dialectical analysis offers a focus on change, insistence on relevance to human material conditions, and an ethic of interrelatedness that is less promoted, if not lacking, in much of Western scientific thought.

Logical and real contradiction

A hundred years ago, Dühring criticized Hegel for his concept of contradiction by saying that contradiction is a logical relationship, not a relationship between things or events in the world. [4] Dühring's argument is still the basic standpoint for Western science whenever it is confronted by dogmatic Marxist-Leninist claims.

The formal logic objection to dialectical contradiction is summed up well by Roy Edgley (1982, 25):

"According to most non-Marxist doctrine, contradictions can occur only in thought . . . not in the reality that thought is about . . . Oppositions in material reality, e.g., between forces such as gravity and inertia, can only be conflicts. To imagine otherwise would be to commit oneself to the nonsensical claim that such conflicts, being contradictions, would be truly described by contradictory statements. What is nonsensical about this of course is that a contradictory statement must be false, that is, the contradictory state of affairs that such a statement apparently describes is logically impossible."

Dialectical logic: necessary or useless?

To this argument, dialecticians oppose the necessity of an alternate logic that will describe the contradictions that they contend actually do exist (FML Chap. III). (A textbook example is that light is both waves and particles.) The rigidity of formal logic, they claim, prevents us from dealing with what is really out there.

The assertion that there can be a dialectical logic is in turn criticized for the failure of such a logic to aid in distinguishing truth from falsity by deduction (Popper 1968).

The Critique of Contradiction, Continued

Dialectical logic: necessary or useless? (continued)

Since contradictory propositions can only be followed by contradictory conclusions, there is no narrowing of possibilities. Or, as Popper objects (1968, 319), "A theory which adds to every information it asserts also the negation of this information can give us no information at all." Then, according to this argument, since there is no refuting such a theory, it is useless to science, which, while it can never provide all cases to substantiate a theory, can provide enough cases to refute it.

The abstract and the concrete

The dialectical response to this concept of theory is to set experience against abstraction. In the contemporary explanation of Sean Sayers (Norman and Sayers 1980, 120-23):

"The idea of a non-contradictory theory is an abstraction. All real theories — the actual thoughts of actual people — are imperfect, limited, finite, relative, and thus contradictory."

He goes on:

"Concrete and practical thought seeks not just to be *valid,* but to be *true.* And mere formal validity is no guarantee of truth . . . In the abstract, one can never have any good reason for asserting a contradiction; but in concrete circumstances one may well have good reasons for asserting both sides of a contradiction."

Orthodox and heterodox contradiction

Orthodox dialecticians insist that there is a contradiction in reality. Non-conformist Marxists, on the other hand, are not willing to forego the principle of non-contradiction, and point to that part of Marx's analysis in which contradiction is not essential (Colletti, 1975).

The Critique of Formal Logic

Formal logic fragmentation

There is an argument, however, which avoids these extremes. Heilbroner (1980), for example, argues that the formal logic insistence on non-contradiction entails dealing only with disconnected phenomena. Formal logic deprives the parts of a process of their relationships.

The Critique of Formal Logic, Continued

Fragmentary science

The tendency to isolate elements of a process, according to a similar view, has made medicine take a fragmentary approach to health, separating what is biological from what is social and making connections between them as an afterthought, rather than seeing their simultaneous occurence. It has encouraged piecemeal devastation of the natural environment rather than ecological awareness and preservation (Levins 1981).

Need for new method of analysis

A reliance on the static and the isolated is not sufficient to answer the questions raised by the social and technological applications of contemporary science. For that reason, methods of analysis oriented to change and interrelatedness are being sought in many fields. Systems theory is an example of one such method; "critical theory," based on dialectics, is another. These alternative approaches, along with their theoretical aspects, inevitably have political and social ones.

Surrogate debates

The social-political aspect of competing theories is also relevant to the argument about contradiction. One explanation for its recurrence over the last century is that it has served as a surrogate debate. The hidden issues are Marxist versus Western science (Popper 1968), Soviet Marxism versus Marxist humanism (Colletti 1975), and Communism versus democracy (Hook 1940, Wilson 1940, Acton 1955).

Trialectics and Contradiction

The issue: what drives change?

The issue of contradiction is a major point of the trialectical departure from dialectics, as it is a major point of difference between dialectics and formal logic. Between formal logic and dialectics, however, the emphasis is on whether something logically contradictory can take place in reality. Between dialectics and trialectics, the emphasis is not the appropriateness of the formal logical principle, but on whether contradiction is the driving force of change.

Combining two logics not enough

In Ichazo's view, dialectical logic has become our prevailing metaphor for explaining change, and we have lost sight of permanence. Formal logic and dialectics cannot simply be combined or used together to regain the connection to permanence. Not only do the terms of one logic exclude the other, but neither can deal with the acceleration of change that threatens to overwhelm us.

Trialectics is not revisionist dialectics

In trialectical theory it is not necessary that change be self-generated by contradiction in a material reality that is the basis of all things. Contradiction as a motive force of change, however, is the fundamental principle of dialectical materialism.

In its emphasis on opposites as complementary rather than antagonistic, trialectics may sometimes seem like contemporary revisionist dialectics sounding the note of interrelatedness in all things. Trialectics, however, is not revisionist dialectics, for (as discussed in the following sections) it differs fundamentally from dialectical theory.

Part 2
Dialectical and Trialectical Theories of the Nature of Matter

Introduction

Different underlying concepts

Theories of the nature of physical reality underlie both dialectics and trialectics. In neither case, as currently presented, do they achieve the rigorous demands of scientific theory. In dialectics the theory is not meant to be metaphysical, and it is claimed that dialectical materialism is in accord with current scientific discoveries. Trialectics also lays claim to a logic that is in keeping with contemporary science, but Ichazo (1982, 24) considers metaphysics an "indispensable element of thought." Because none of Ichazo's work deals extensively with the nature of physical reality, the conclusions we derive from his writings are necessarily provisional. There is enough material, however, to suggest important differences between dialectics and trialectics.

Sources for dialectical materialism

The sources for the summary of the dialectical materialist explanations of physical reality are Engels' *Dialectics of Nature* (1940, 1954); *The Fundamentals of Marxist Philosophy* (hereinafter referred to as FM), an official publication from the Institute of Philosophy of the Academy of Sciences of the Soviet Union — a post-Stalinist but not progressive text published in 1958; and its successor, *The Fundamentals of Marxist-Leninist Philosophy* (FML), a 1974 Soviet textbook based on the materials of the 24th Congress of the Communist Party of the Soviet Union in 1971.

Sources for trialectics

The sources for the summary of the trialectical explanation are Ichazo's books (1976, 1982, Arica 1982), and instructional materials used in 1982. [5] (To aid readability of the point-by-point comparison, page references to all sources have been omitted.)

Matter and energy

Matter and energy, categories that are, in contemporary science, interconvertible, are conceptually comparable to the "matter and motion" categories of 19th century dialectical materialism, although the explanations of physics have changed. In trialectics, "movement" refers to change in the physical world, while "energy" is both something which is convertible with matter and something which in its pure state has no material manifestation.

Point-by-Point Comparison

Comparing matter and energy

First, we will compare the basic categories, matter and energy, in dialectics and trialectics:

Dialectics	*Trialectics*
Energy does not exist separate from matter: "There is no matter without motion and no motion without matter."	Energy can be "pure radiation" without material manifestation.
Everything is material: "There is nothing in the world but matter in motion . . . "	Everything that is material is a manifestation of cosmic energy.
	The material world is in motion: "Everything in nature moves."
	Matter and movement are limited by time. (See below.)

Comparing matter, time, and space

Next, we compare what is said about matter, space, and time:

Dialectics	*Trialectics*
Space and time are forms of existence of matter and are boundless and infinite.	(There are no references to "space" in the available material.)
	Matter is a form of time: "Matter is substantially a concentration of time."
	(In the trialectical literature, matter is said to be both a concentration of time and a concentration of light. Neither light nor time is defined. See below the comparison of the dialectical and trialectical understanding of matter and light.)
	Time implies movement: "In the presence of time everything moves."
	Times has limits.

Point-by-Point Comparison, Continued

Comparing matter and light

Dialectics and trialectics also define matter and light differently:

Dialectics	*Trialectics*
Light is a form of matter although "it [has] no rest mass or substance."	Matter is a form of light: "Light, as it becomes matter, evolves from one manifestation to another." "Matter evolves from the concentration of light."

Comparing matter and consciousness

And last of all we will compare matter and consciousness:

Dialectics	*Trialectics*
Matter is primary; consciousness is secondary, a product of matter. Consciousness is material, an outcome of the brain.	There is a beyond-the-limits-of-time/matter, a beyond of no movement and no change. The "beyond" is consciousness, which is eternal and unchanging. Consciousness precedes its material manifestation: "The body is the fruit of consciousness."

Summary

Material reality limited

While there are only a few statements about the nature of physical reality in trialectics, they indicate a non-materialist view. Trialectics differs from dialectics, in addition, by its insistence on limits to material reality and to the process of change.

Conceptual reversals

Regarding energy, time, and light, trialectics reverses the formulation of dialectical materialism. Energy is not a property of matter — matter is a manifestation of energy. Time is not a form of matter — matter is a concentration of time. Light is not a form of matter —matter is a form of light.

These reversals are related to precedence: first energy, then matter. In trialectics, energy and matter are the same in the sense that matter is a form of energy; in dialectical materialism, energy and matter are one in that one never occurs without the other.

Part 3
Comparing the Axioms of Dialectics and Trialectics

Overview

Introduction

Both dialectics and trialectics offer characterizations of change stated as "laws." (See Table 1) We will present a point-by-point comparison of the two approaches to these "laws" or axioms in this section. To begin with, we give an overview of the highlights of the comparison. The axioms and their accompanying explanations reveal basic differences between the dialectical and trialectical concepts of change.

Occurrence of change

First there is the question of in what way change occurs.

Dialectics	*Trialectics*
Quantitative change occurs constantly and gradually.	"Physical processes are not processes of gradual change . . ."
Qualitative change occurs in leaps.	All changes occur in jumps.

Direction of change

Next, there is the question of the direction of change.

Dialectics	*Trialectics*
Change is progressive; it is movement in an ascending spiral; change is not regressive.	Change can be ascendant or descendant.

Limits of change

Thirdly, there is the question of whether change has limits.

Dialectics	*Trialectics*
Quantity bursts the measure; limits are broken. It is breaking the measure that makes the qualitative change that occurs in a leap.	Limits are not broken; they are matched by an "infilling" of energy. It is the correspondence of energy to limits of a new equilibrium that occurs in the jump of change.
Change is unendingly progressive.	Change is recurrent; it is cyclical.

Overview, Continued

Origins and mechanism of change

Finally, there is the question of how change originates and how it works.

Dialectics	*Trialectics*
Change originates in conflict (contradiction) and proceeds by negation.	The pattern of change is pre-established, and proceeds by attraction.

Summary

Dialectics and trialectics thus differ on these points:

- Whether *all* change is by leaps, or only *some* change.
- Whether change is of necessity progressive.
- Whether change is unending or limited.
- Whether change requires conflict.

The Approach of This Section

Sources for this section

In both dialectics and trialectics, the axioms are stated in slightly varying forms according to the sources. The classical formulation of dialectical axioms is given by Engels (1940, 26; 1954, 27, 81-83). Lenin subsequently elaborated sixteen points concerning dialectics (Bochenski 1963a, 92-93). Stalin summarized four main principles (Bochenski 1963a, 93). Current Soviet handbooks (FM, FML, cited in Part 2; see Reference List) paraphrase Engels.

Trialectical axioms have been presented, in slightly different forms, in two books by Ichazo (1976, 1982). The most recent formulation of these axioms is that which Ichazo presented in lectures in London in December, 1982. (The abbreviations BMP, HP, INT refer to these presentations; see Reference List.)

Ichazo's axioms of trialectics are accompanied by subsidiary statements, which, again, vary somewhat. These statements stand in more than one relationship to the axioms — some are explanatory, some define, some are axiom-like. In dialectics, there is no comparable standard arrangement of explanation and definiton.

Format of this section

As the axioms of trialectics are presented, there are unstated "givens" and unstated definitions hidden within them. To point these out, we have assembled stated and unstated elements of trialectics in a rewritten form as a device for identifying underlying assumptions.

The Approach of This Section, Continued

Format of this section (continued)

For purposes of comparison, we have rewritten the axioms of dialectics as we did those of trialectics, with givens and definitions. What usually appears as explanatory text for the axioms of dialectics is given here in subsidiary explanatory statements like those that accompany the axioms of trialectics. These subsidiary statements are not a standard of dialectical presentation, but are our own format.

Comparing the First Axioms

First axiom of dialectics: quantity to quality

The first axiom of dialectics is the axiom of quantity to quality:

Given: Change must occur; the universe is material, and matter and motion are inseparable.

Definition: Change is of two kinds: quantitative increase or decrease, which is gradual and does not change the object or phenomenon itself; and qualitative, which is a leap that is a change of state.

Axiom: **Change of state occurs by the gradual increase or decrease of quantity within an object or phenomenon, to the point where qualitative change takes place.**

Explanatory Statements: (FML 134-41; FM 16-17)

Quantitative change occurs by virtue of the fact that matter and motion are one; matter *is* quantitative change.

There are states of aggregation where quantitative change is transformed into qualitative change; these are called nodal points.

"Quality of things is inseparably linked with a certain quantity. An example of the dependence of quality on quantity is that one proton more or less in the nucleus of an atom makes a different element. This connection and interdependence . . . is called the *measure* of a thing." (FML 135)

"Quantitative changes, having reached a certain point, break the measure of the object and (thereby) evoke fundamental qualitative changes. As a consequence, objects change . . ." (FM 17)

"Quantitative changes occur *constantly* and *gradually*." "All qualitative change occurs in leaps." (FML 136-37)

Leaps can be instantaneous or long-lasting. (This supplement to earlier theory is an attempt to deal with the evolutionary transformation of one species to another over long periods of time.) (FML 138; FM 17)

Comparing the First Axioms, Continued

First axiom of trialectics: mutation

The first axiom of trialectics is the axiom of mutation:

Given: Change must occur so long as time is present. [6]

Definition: Change is a jump from one state to another.

Axiom: **Change occurs by the jump of energy between neutral points of energy retention.**

Explanatory Statements: (HP; [5]; [7])

Stable states of matter occur where energy is retained. Such points of retention are called MMPs — material manifestation points.

MMPs are pre-established.

Change occurs when the equilibrium internal to the retained energy is affected by interaction with other MMPs.

All changes occur in jumps.

Nodal Points and MMPs

Hegel's nodal lines of measure

The dialectical explanation of the transformation of quantity into quality requires the concepts of "measure" and "nodal points." These concepts go back to Hegel (1975, original date 1830), who wrote not of nodal points but of nodal lines of measure. Measure is the unity of quantity and quality; quantity and quality are thus opposites.

"[The] process of measure, which appears alternately as a mere change in quantity, and then as a sudden revulsion of quantity into quality, may be envisaged under the figure of a nodal (knotted) line. Such lines we find in Nature under a variety of forms . . . the qualitatively different states of aggregation [that] water exhibits under increase or diminution of temperature . . . the different degrees in the oxidation of metals . . . even the difference of musical notes." (§109)

Marxist nodal points

Nodal points, in Marxist-Leninist thought, are points "in the process of the gradual differentiation of matter" that mark off qualitative differences. They are the "discrete (discontinuous) states of matter at its various structural levels (elementary particles, nuclei, atoms, molecules, and so on)." (FML 138)

Nodal Points and MMPs, Continued

Marxist nodal points (continued)

A nodal point, in a general sense, is, like an MMP, the demarcation of a change of state. The concepts underlying nodal points and MMPs are, however, quite different. We won't attempt to assess what underlies Hegel's presentation of nodal lines. Although Engels and Lenin based much of their writing on Hegel, the terminology and the concepts they borrowed from him have undergone shifts in meaning.

Nodal points, energy, and matter

It is basic to Marxist-Leninist thought that there is no motion without matter. Matter and motion are inseparable, a ceaseless struggle of the opposites quantity and quality, the opposites continuity and discontinuity. The movement that is matter does not occur as if along a smooth line, but along a knotted one, where knots are understood as points where continuity is interrupted by discontinuity.

Engels (1954, 385-86) defined nodal points as "discrete parts [of matter] . . . which determine the various qualitative modes of existence of matter in general." The context for Engels' understanding of matter and change is the development of atomic theory in the late 19th century. Mendeleev's periodic law was published just six years before Engels began writing *Dialectics of Nature*. In his explanation of the quantitative determination of quality, Engels mentions "the new atomistics" that began with Dalton in the previous generation as support for the existence of nodal points.

Engels saw new scientific discoveries as proof that the properties of matter are determined by matter. There was no mysterious force outside of matter accounting for change. Nodal points were to be yet one more piece of evidence of the material basis of all things, and of the dialectical process of nature.

MMPs, energy, and matter

MMPs, by comparison, are points of energy retention in a universe where energy or motion can be "separate" from matter. Trialectically, energy traverses a pattern of MMPs; it moves up and down this scale, and manifests in various material forms at pre-established points. The properties or qualities of matter are not determined by the self-movement and struggle of matter. They are pre-established, and result not from the quantitative activity of matter, but from an "infilling" of energy into qualitative "holes" in such a way that energy manifests as matter itself. ([7])

In trialectics, continuity and discontinuity are not in contradiction; there are no fighting forces within matter. The operation of nature is not dialectical.

Equilibrium

Importance of third element: equilibrium

As described by Ichazo, when process (the "perpetual movement of all creation" [HP 110]) "crosses" certain points in the pre-established pattern of change, a material manifestation specific to that point results.

Nature is at all times in a process of change. This change is never random; the energy of the change must jump to a pre-established higher or lower point. The jumping points are the MMPs.

The energy retention of an MMP is an equilibrium made manifest. The MMPs are "neutral," that is, they add nothing to and subtract nothing from the process of change. Equilibrium, however, is active, and must move up or down to another MMP; the energy retention of the MMP is only temporary.

Trialectical equilibrium a "force of circulation"

The usual concept of equilibrium is that there are two elements, weights, tendencies, or directions that balance. In trialectics, equilibrium is a third element — function, or equilibrium itself.

Equilibrium is itself operative, and is not just the result of two things acting. In the formula "active-attractive-function-result," function is the same as equilibrium. (For an explanation and applications of this formula, see Horn's [1983] paper in this volume; Caswell [1983] gives detailed analyses of complex problems along these lines.) The function of the process is to achieve equilibrium.

What trialectical equilibrium is becomes clearer if it is thought of metaphorically as a force of circulation rather than as a state of balance. From the trialectical viewpoint, in focusing on two elements of change (posit and negation, or thesis and antithesis), dialectics has failed to note the third element, function.

The Importance of the First Axiom in Trialectics

Physics and metaphysics

Just as 19th century thinkers were influenced by Newtonian physics and by new discoveries in chemistry and biology, Ichazo feels that it is necessary to respond to 20th century science:

"It is obvious that we need a new system of logic. Physics, biology, chemistry, and the new electronic technology are forcing us to discover a new logical system." (BMP 62)

Physics and metaphysics (continued)

In response to the new physics, Ichazo proposes a new metaphysics, a logic "for analyzing the eternal questions: the primal cause, the universe, and the human soul." (BMP 3) For Ichazo, metaphysics along with philosophy, if they are not to "become merely expensive luxuries difficult to afford," (BMP 23) must be useful tools for dealing with growth and change. Change must be understood in keeping with science.

Concept of identity and survival

Ichazo's metaphysics begins with identity, and traces the development of identity as a principle of logic over the course of Western history, and as a psychological principle in the individual. In Ichazo's theory (BMP 23-35, 60-65, 69-73, 89-91), both individually and historically, we identify with what we depend on for survival. The logic we use is an extension of the process of identification (BMP 28).

Identity determined by level of development

What we depend on for survival is determined by our stage of development. Change in identity is required when there is a change in what is needed for survival. Revolutions in logic accompany great crises in history just as change in sense of identity accompanies the crises of individual life — childhood, adolescence, and maturity. (BMP 27, 60-65, 70)

In trialectics, the need to establish identity, and to sustain it logically, is always operative, but there is one logic to deal with permanence, another to deal with change, and a third to "put together what is permanent and what is changeable into the same package . . . ." (BMP 73) Ichazo says that these logics are discovered, not invented, and that they have a historical progression.

"In this theory [trialectics] we say that the discovery of the 'logic of the unity' is the third and most dramatic of the three crises that humanity has had, since it enables its entry into maturity." (BMP 62)

Identity defined by needs of time

The first axiom of logic, for Ichazo, is always identity, but identity as defined by the needs of the time. The intellectual proposition of identity, like all processes as explained by trialectics, does not change gradually and continuously but changes by leaps. One of Ichazo's examples (BMP 40-41, 71) is that in Hegel's dialectic, when "identity" became "movement," there was an intellectual leap from the definition of identity as permanence to the definition of identity as change.

The Importance of the First Axiom in Trialectics, Continued

Identity defined by needs of time (continued)

With this advance, logic could be used to deal with change without the reference to permanence required by formal logic. The limitations of this logic, from the trialectical point of view, are that (as dialectical materialism) it posits change as endless, while in actuality we are met with limits to the changes we can initiate and endure.

Identity and the first axiom

In trialectics, the first axiom, the axiom of mutation — the assertion of pre-established points of material manifestation — "replaces the law of identity. Identity here means to identify our process and where we are in it. That is identity for us, our location in the process." (BMP 93)

Summary: First Axioms

Change and its description

In dialectics, everything changes. In trialectics, everything *is* change. In dialectics, there is quantitative change and qualitative change. Quantitative change is gradual; qualitative change occurs by leaps and as a result of quantitative increase or decrease.

In trialectics, all changes are jumps that occur at the pre-established jumping points. This "qualitative" jump does not depend on quantitative increase or decrease. In fact, trialectics does not use the terms quantity and quality except in reference to dialectics. In dialectics, quantity and quality explain change; in trialectics, pre-established points account for change.

Relationship of change and matter

In trialectics, change is not something that happens because of what matter does or because of matter's inherent self-movement. Change is a force that acts on matter; it is an energy of equilibrium. There is, so to speak, a "moving equilibrium" that manifests materially at pre-established points. The pre-established points are neutral. They do not influence the moving equilibrium.

Although quantitative increase or decrease take place, it is not because the points experience a quantitative change that a jump occurs. It is because moving "change" reaches a point where a specific manifestation is inevitable. All changes thus occur in jumps.

We commonly think of change as a measure or index of what happens in the movement of matter. Trialectics suggests that matter is an indication of what happens in the movement of change.

Comparing the Second Axioms

Second axiom of dialectics: unity and struggle of opposites

The second axiom of dialectics is the axiom of unity and struggle of opposites:

Given: All movement occurs by the attempt of opposites to overcome each other.

Definition: Opposites are antagonistic. [8]

Axiom: **Every object or phenomenon is a unity of antagonistic opposites; from the struggle of opposites comes change.**

Explanatory Statements: (FML 141-52; FM 19-21)

The unity of opposites is relative; the struggle is absolute. (FML 144)

Contradiction may be within the object — internal, or between objects — external. (FM 19)

Movement arises from *internal* contradictions. (FM 19)

Contradiction is unending; movement and matter are eternal and endless.

Second axiom of trialectics: circulation

The second axiom of trialectics is the axiom of circulation:

Given: All movement is interaction which serves to sustain the whole.

Definition: What appears to be conflict in the interaction of opposites is, in terms of the whole, complementarity. To avoid the connotation of conflict, opposites are called "apparent opposites."

Axiom: **Every point of energy retention exists by virtue of its apparent opposite; this polarity makes the circulation of energy possible.**

Explanatory Statements: (HP; [5])

Opposites are complementary and interdependent, not antagonistic.

Each MMP is in a dynamic equilibrium with its apparent opposite.

The equilibrium between two apparent opposites unites them in one MMP of process.

Equilibrium depends on circulation of energy between or within MMPs.

Nature, defined as one MMP, is a dynamic manifestation of complementarity, not conflict.

Circulation of energy is never random.

The Dialectical Statement of the Second Axiom

Motion inherent in matter

Dialectics explains change by saying, first, that motion is inherent in matter; the two are inseparable. As Engels (1940, 35) writes:

"Motion in the most general sense, conceived as the mode of existence, the inherent attribute, of matter, comprehends all changes and processes occurring in the universe, from mere change of place right to thinking."

Within the movement of matter is quantitative increase or decrease and the subsequent change of quality.

Struggle of opposites

Second, change of a unity as a result of the struggle of its opposites is axiomatic. The unity of opposites is not simply a condition in which extremes are defined by their connection. Opposition is antithesis. It is not the connection of poles that will be the opportunity for change, but their opposition. Lenin gave the word on this:

"The unity (coincidence, identity, equal action) of opposites is conditional, temporary, transitory, relative. The struggle of mutually exclusive opposites is absolute, just as development and motion are absolute." (FML 144)

Through struggle comes change. As a Soviet text says:

"In all things, phenomena and processes there are internal, contradictory aspects and tendencies which are in a conflict situation. This conflict gives development its inner impulse and leads to the sharpening of the contraries which are finally resolved through the disappearance of the old and the coming to be of the new." (FM 19)

Contradiction and Qualitative Change in Dialectics

Description of contradiction

In dialectical materialism, contradictions are of two types: external — between two distinct objects, and internal — within "the essence of one and the same object." It is internal contradictions that cause movement and development. Because the fundamental contradiction is internal, change or movement is self-movement. There are no external or other-worldly causes of change. "Matter contains within itself the cause of its own development." (FM 20)

Description of contradiction (continued)

A contradiction starts small, builds up until it can no longer be maintained in the unity of opposites, and then achieves its resolution, in which the unity disappears and there is a fundamental change to another unity.

The unity of opposites is a structure "such that each of the aspects of the whole is entirely dependent on its opposite for its existence . . ." (FML 143) At the same time, because the opposites are antithetical, they struggle.

"The struggle of opposites naturally results in the disappearance of the existing object as a certain unity of opposites and the appearance of a new object with a new unity of opposites . . ." (FML 144)

How this disappearance "naturally results" has to do with how negation operates; opposites negate each other, as explained in the third axiom of dialectics.

Quantity and quality are opposites

Since the resolution of contradiction results in a new object, there is implicitly a qualitative change, since "Quality is that limit whereby an object is distinguished from other objects." (FM 16) Qualitative change, as we know from the first axiom, also follows quantitative change. Quantity and quality are themselves opposites in the unity of measure, but not much is made of this in Marxist-Leninist literature.

In fact, while Engels considered Quantity into Quality one of the three great laws of dialectics, Lenin did not. For him, there was a more general law (one of Lenin's sixteen points on dialectics) of transformation from *every* determination to every other. (Bochenski 1963a, 92-93)

Appearance of qualitative change

Whether there is a causal relationship in which contradiction engenders quantitative change, or quantitative change builds up contradiction is not made explicit by Engels or Lenin. The first two axioms just say that qualitative changes are revolutionary leaps which grow out of the struggle of contraries and are preceded by quantitative change.

In classical Marxist-Leninist dialectics, contradiction is the sine qua non of change:

"A phenomenon cannot disappear and be replaced by another phenomenon until its contradictions are revealed and fully developed, because only in the process of such development are the preconditions for the leap into the new qualitative state created." (FML 145)

The Trialectical Statement of the Second Axiom

Polarity: opposites need each other

Trialectically, "everything functions in relation to something else," (BMP 75) a something else which a dialectical viewpoint will call its contrary, but a trialectical viewpoint will recognize as a polarity making circulation possible.

"In nature, everything works with everything. Predator and prey are one interactive thing. One could not exist without the other. The electron and the proton are not opposites; they are one thing, because without the electron the proton doesn't exist; the atomic nucleus is impossible. So we call the second law the law of circulation, or in other words, the law of polarity." (BMP 94)

Trialectical opposition is not antithesis

In trialectics, opposition is not antithesis. The important thing about opposition is that it serves circulation of energy. Circulation requires a circuit; polarity marks the limits that make this circuit. Since the poles are interactive, they are called *apparent* opposites, as in the first subsidiary statement to the axiom of circulation: "Inside everything is the seed of its apparent opposite."

Examples of only-apparent opposites are given ([5]): night/day, hate/love, tiger/deer, cold/heat. Another example given elsewhere is: "Life is the seed of death, as prey is the seed of the predator, and vice versa." (BMP 63-64) Opposition in these examples refers to qualities, characteristics, classes, relationship between MMPs in a cycle. To take an example above, to arrive at "deer" as the opposite of "tiger" requires reference to the classes of prey and predator in an ecological cycle. To identify apparent opposites, it is necessary to see the cycle they participate in.

The biggest cycle of all unites all apparent opposites in interaction: "From the cosmic viewpoint opposites do not exist." (HP 111) That is, there is no opposition as antithesis. Or, as Ichazo says elsewhere, "There are no contradictions in nature . . ." (BMP 63)

Contradiction in Trialectics

Contradiction as absence of equilibrium

In early versions, one of Ichazo's subsidiary statements reads:

"The absence of function provokes contradiction which in turn struggles to find equilibrium that can only be resolved downward." (HP 110)

Is this "provoked contradiction" any different from the "internal contradiction" of dialectics which motivates all change?

In trialectics, contradiction is not due to the presence of opposites; it is due to the absence of equilibrium.

Contradiction in Trialectics, Continued

Contradiction used in different senses

Ichazo uses the word "contradiction" in two different senses. There is "contradiction" as absence of equilibrium, and "contradiction" as a dialectical concept. "There are no contradictions in nature," is a statement made by Ichazo in reference to dialectics and in the sense that there is no antagonism in nature, ". . . there is only interdependence." (BMP 63) Contradiction in relation to the second axiom is the condition of apparent opposites when the circulation of energy between them is blocked. It is not inherent antagonism or antithesis.

Contradiction in natural processes

Does this type of contradiction occur in natural processes? The question can be rephrased: Are equilibriums in natural processes ever disturbed? On a small scale, for individual phenomena within the cosmos, yes. Overall, no. The cosmos itself is in equilibrium. This is a possible answer to the question, but not one that is spelled out in the literature on trialectics. A subsidiary statement to the second axiom, "From the cosmic viewpoint there are no collisions . . ." (HP 111) refers, in a recent version ([5]), to apparent catastrophe as arrangement of a new equilibrium.

The question remains why contradiction/loss of equilibrium is said to precede *downward* change in early versions of the axioms, while in a later statement Ichazo says that energy will go up *or* down following loss of equilibrium. (BMP 75) We have no answer to this question. The confusion raised by this early version is avoided in the most recent formulation of the first axiom ([5]), in which no mention at all is made of contradiction or downward change.

Nature and Society

Nature and man in dialectics

The idea that natural and social process must be governed by the same laws is part of the dialectical materialist position that "the world is one." (FM 9; FML 100) Consciousness is material; it has its basis in matter, and the same laws that apply to matter apply to consciousness, or thought, and to social processes, which in any cases arise out of material conditions.

Nature and man in dialectics (continued)

In Hegels's dialectic, too, the same laws apply to thought and to nature. But Hegel, the Marxists say, put reason first — consciousness, mind, spirit is his starting point. The basis of consciousness is not material. In Hegel's dialectic, consciousness and matter evolve together until, finally, "The real is rational and the rational is real." Social progress can then be a manifestation of mind/spirit, rather than of economic realities. Dialectical materialism rejects this possiblity, which leaves the door open to a religious or philosophical justification of the status quo without any regard to material economic conditions.

Nature and man in trialectics

The axioms of trialectics, also, apply to the social world as well as the natural. Man is the product of nature and is thus subject to the same laws; man has to live under the "terms" of an "objective reality" which made him. (INT 168) Reality, however, is not just material manifestation.

Ichazo does not use the categories "natural world" and "social world" in his presentation of trialectics; he just gives examples of trialectic change that can be put in both these categories. "Intellectual propositions," for instance, like natural processes, occur only in jumps. (BMP 40)

Nature is repeatedly given as an example of the operation of the second axiom in trialectics. In one of its earlier formulations this axiom read:

"Everything in nature is in movement. Everything in nature is movement and is the seed of its apparent contrary." ([7])

All versions of the axiom have a subsidiary statement to the fact that there are no accidents in nature. The recent version ([5]) ascribes the element of "achievement" and thus "accident" to human effort, and asserts that there is no element of achievement in nature. This distinguishes natural from social process.

The reference to nature (whether in the statement of the axiom itself or in subsidiary statements) seems to stand as an example of the axiom rather than as a limiting case.

Contradiction and social process in trialectics

In trialectics, contradiction as antithesis is ruled out of processes occurring in nature by the second axiom. But since social processes have the added element of achievement and thus accident, can they also have the added element of contradiction?

Contradiction and social process in trialectics (continued)

Contradiction in social process is recognized by Ichazo when he says that the Industrial Revolution and its preconditions were "the outcome of contradiction. Man no longer [felt] himself to be participating in a universal harmony." (BMP 26) Psychologically, contradiction — being at odds with oneself, having contrary impulses at the same time — is recognized in Ichazo's thought. (BMP 105-06) But psychological opposites need not be in contradiction. Ideally they are balanced. For this balance is required the presence of a third element, an objective and neutral point of adjustment.

Ichazo's statement below suggests that contradiction can operate to bring change in social process until the material limits of the natural world are reached:

"The second law of dialectics contradicts the reality that we now know. Since we have discovered that we live in a limited world, opposition as a mechanism of change no longer works . . ." (BMP 63)

Contradiction and conflict

Through a dialectical process of contradiction and competition we have conquered the planet. Now that we are capable of destroying it, to push contradiction further will be self-destructive:

"The contradictions within Western culture have reached such massive proportions that we must either change or die . . . the logic of technology is driving us faster and faster into a culture of perpetual change in which we are exhausting both our psyches and our natural resources." (INT 21-22)

Contradiction as conflict, then, can occur in social process, according to trialectical theory. Contradiction as conflict, however, is not a principle of change in trialectics, whether the change is in the social world or in nature. A pre-established pattern, circulation, and attraction are the principles of trialectic change.

Real and logical contradictions

Ichazo does not address the issue of whether real conflicts are the same as logical contradiction. His statement that "there are no contradictions in nature" does not refer to logical contradiction. And although he points to an attitude of antagonism in social process, nowhere does he suggest that there is contradiction in the logical sense.

Trialectically, as a principle of logic, contradiction is an intellectual proposition which itself changes over time. It is one thing in formal logic, another in dialectics, and another in trialectics.

Summary: Second Axioms

Contradiction: real and apparent

In dialectics, the motive force of change is the struggle of opposites; in trialectics it is equilibrium. Dialectics adds the notion that opposition is inherent in all things, and is inherently contradictory. A thing is both itself and its opposite at the same time. This is where dialectics encounters objections from formal logic.

In trialectics also, opposition is inherent in all things: "inside everything is the seed of its apparent opposite." However, opposition is devoid of contradiction. As "seed," the apparent opposite is analogous to the dot of white within the black of a yin-yang symbol, or the dot of black within the white. ([7]) Nothing exists without polarity and without a cycle of movement in which the poles are related. This is not to say that a thing exists at one and the same time as itself and as its contradictory. Rather, a thing exists by virtue of its necessary relation to an apparent opposite: Inside the predator is the seed of its prey, that which enables it to recognize its prey as prey. Or a thing contains the potential which will become its apparent opposite: "In a child there is old age; in old age there is a child." (HP 111) A thing will itself mutate to its apparent opposite (childhood-old age) or it will be involved in a necessary mutation with an apparent opposite (predator-prey).

Comparing the Third Axioms

Third axiom of dialectics: negation of negation

The third axiom of dialectics is the axiom of the negation of the negation.

Given: Matter is eternal, endless, and unlimited. However, each thing is mutable, determined, and limited.

Comparing the Third Axioms, Continued

Third axiom of dialectics: negation of negation (continued)

Definition: Change means the appearance of the new; it is not just the rearrangement of phenomena.

Axiom: **No development can occur that does not deny its previous form of existence; a change can only advance from a prior state, it cannot regress.**

Explanatory Statements: (FML 153-59; FM 22)

The destruction of the old by the new is called negation.

Negation is not empty; it does not produce nothingness. A continuity exists between that which is negated and that which negates.

By negation of the negation, certain features of initial stages are repeated at a higher level in the new stage. This is called spiral development.

Third axiom of trialectics: attraction

The third axiom of trialectics is the axiom of attraction.

Given: Functional wholeness requires hierarchical organization.

Axiom: **All points of energy retention are connected by the necessary attraction of energy up or down a hierarchical ladder.**

Explanatory Statements: (HP 110-11; BMP 75, 94)

Energy can only be retained at fixed points, not in between.

Mutation from one point of energy retention to another can be ascendant or descendant.

Energy interchange is perpetual and cyclical.

Higher MMPs, compared to lower MMPs, have:

- more permanency
- fewer factors and elements
- greater external expansion
- less internal movement
- greater range and
- are subject to a smaller number of laws. ([7])

When internal time changes, MMP changes. ([5])

Dialectical Negation

Opposites negate each other

"If there were no internal contradictions, there would be no movement." (FM 19)

"Qualitative transformation is possible only as the negation of the old state." (FML 153)

As these quotations from Soviet texts indicate, contradiction brings movement or change through negation. In everything, two antithetical elements oppose each other; inherently, each is the negation of the other. (Since their struggle will break the form that contains their relative unity and lead to its replacement, that unity itself contains its own negation in its contradictoriness.)

Negation not simple destruction

Negation is not simple destruction. Whatever is negated conditions the new form that comes out of the struggle. Some negated elements are transformed and passed on, "sublated."

This notion can be traced back to Hegel's use of the verb *aufheben* to describe what happens in the process of negation. It has various meanings: to put up, uplift, to put away, to preserve, to do away with. Negation is determinate in Hegel; something determinate (that is, precisely limited) is negated,and that something has a determinate (that is, defining) effect on the result of the negation. Engels ([4]) takes up the same idea and says that negation "does not mean . . . destroying [something] in any way one likes."

Negation splits unity in two

The first negation is of the unity itself; it is a split in which the two contraries assume independent existence. For instance, the working person is initially, early in human history, the owner of his or her own tools — a producer-worker, and is the user of the product of those tools — a consumer-worker. In time, this unity splits into producer and consumer, into owner and employee, into capital and labor. The unified form of production is negated.

Spiral development

Another negation must occur to take the split form to a resolution of the contradiction — *the negation of the negation.* In this case, it will be socialism that negates capitalism, uniting worker and means of production on a higher level of production and social interaction than existed in the previous form. This restoration of aspects of the initial form at a higher level is progressive or "spiral" development. (FML 154-59)

Negation an ideal paradigm

This example of an initial form, a split, and a resolution is an ideal paradigm and not all of Marx's (1976) examples in *Capital* will fit it. It is a paradigm not only for the three stages of dialectical movement, but for Marx's conviction that labor — production, accomplishment — is the central feature of human society, the basis of human development in all spheres. It serves as an example of Marx's historical method of analysis, of his insistence that it means nothing to interpret dialectical movement just in terms of ideas, of philosophy.

Negation builds upward

Negation, in dialectical theory, is basically progressive, since in its determinate character the previous stage is like a foundation; thus, negation continually builds upward. The spiral of development is not reversible; it ascends, it does not descend. Marxism-Leninism recognizes that there is a dialectical necessity for regression to accompany progression, but this regression is either the return to previous conditions on a higher level, or it is evidence against "metaphysical" oversimplification of the understanding of progress. (FM vii)

Negation and the appearance of the new

Negation is the operating mechanism by which contradiction causes change. Since matter, space and time are endless, and neither created nor destroyed, change — which is assumed to be the occurence of what is new — cannot come from somewhere outside matter. Nothing new can come from outside material causes, and to matter itself nothing can be added, nothing can be subtracted. (FM 7-8)

How, then, can the new arise? By the mutability within matter, by virtue of the fact that matter is always in motion, that matter has discreteness, that the discrete parts of matter can abolish and replace one another within the indestructible whole of matter itself. And what is true for nature is also true of social process, since social events are based on material necessities.

The discrete opposites that are the unity of a thing will struggle and split, and will thus destroy the thing as a unity (negate it). But the result of this negation is not nothingness; it is the intensification of the opposites such that each becomes an independent element. The opposites will still have a relationship, however, and one of them will predominate. To resolve this second form of the contradiction, another negation is necessary. A synthesis would just be a recombination of elements, and the contradiction would remain. The result of the second negation, however, will be a *new* unity. The new unity will retain features of the old while being qualitatively something new. (Bochenski 1963a, 93; FM 22)

Negation and Attraction

Limits

While matter, space and time are endless in dialectics, in Ichazo's trialectics they have *limits*. These limits define the process of change. Since the points of change are pre-established, they can *attract* change — they already exist as "places" where change will manifest, as optimum states toward which change will tend.

Negation of the negation (whether it is characterized as complete annulment or as a transformation that in some way incorporates the previous state) is not compatible with the cyclical development of trialectics. Negation as annulment allows straight-line development; negation as transformation allows spiral development; neither allows a repeating cycle.

Appearance of the pre-established

Change, in trialectics, is not assumed to be the occurrence of the new, but the appearance of what has already been established. Negation is not necessary for this kind of change. In dialectics, it is said that the plant negates the seed ([4] 148-49); for the plant to appear the seed must die. Dialectics has two points of focus — seed and plant, posit and negation.

Trialectics takes a third point of focus — the movement of change itself — the transfer of energy between seed and plant. This energy is attracted to move up or down. The energy in a seed is attracted toward growth into a plant (BMP 179), or (although this example is not given in the literature) into recycling through decomposition if it does not germinate.

Dialectical reasoning proceeds with the assumption that negation aids change. From a trialectical point of view this assumption may hold, up to a point; past that point the dialectical analysis fails. Ichazo writes:

"Negation of the negation says that every process must deny itself, as in the case of the auto industry where a new model will make the one that is replaced obsolete, otherwise the industry cannot go on; it would be stuck right there. But this cannot go on forever, for the simple reason that our world is not forever. I mean we have limits, and our limit is our planet." (BMP 91)

Ascendant and descendant change

Subsidiary statements of the axiom of attraction of one MMP to another higher or lower MMP define a higher MMP as: more permanent; subject to fewer laws; "conformed by" a smaller number of factors and elements ([5]); and having greater range, less internal movement, greater external effect or expansion.

Negation and Attraction, Continued

Ascendant and descendant change (continued)

Neither Ichazo's laws of trialectics nor his rather brief treatment of this aspect so far give an indication of the exact nature of internal movement. Thus, it seems best to stick with general principles in approaching the question of what is a higher or lower MMP: For physical processes, increase in energy is up, decrease is down.

For identifying higher or lower MMPs in social process, responsiveness and resiliency may be key concepts. When there is no circulation between opposing social forces, contradiction may build to the point of destructive conflict, resulting — under late 20th century conditions — in a lower MMP.

Dialectical materialism requires destruction of the old before appearance of the new. Thus, politically, conflict is necessary to produce revolution and change for the better. Trialectics points out that our social process has reached a limit where contradiction cannot result in a change for the better.

Political conflict now touches the edge of global destruction through nuclear war. The attitude of contradiction with and conquest of nature threatens even the atmosphere of the planet. Even if contradiction brought "upward" change in the past, according to trialectics it will no longer do so.

Summary: Third Axioms

Third axiom and social process

The third axiom, in both dialectics and trialectics, is considered an important principle for explaining social development and historical process.

Winners and losers

In dialectics, inherent contradiction progresses to negation, abolishing the old and producing the new that is the evidence of change. Socially and politically, dialectics requires winners and losers.

Cooperation

In trialectics, change moves through polarities by a process of attraction. Points of change are pre-established; nothing new needs to be produced. Contradiction is counter-productive. When we run out of new possibilities for winners to move on to, negation means everyone loses. Trialectics asserts that socially and politically, cooperation is now the condition of survival.

Summary: Third Axioms, Continued

Importance of maturity and unity

In trialectical theory, historical process has pre-established points of change; attraction up or down operates across these points. In the current stage, when humanity is seen to have completed its external conquests (BMP 109), the point that is considered relevant is "maturity." (See Introduction to this paper.) Ichazo explains, in an interview:

"Total maturity signifies this: understanding each other in totality. That understanding each other in totality cannot be — and please understand me well — the fruit of goodwill. It is not enough. It can only be understood if we understood ourselves, our psyches." (INT 120)

How society moves, in the conditions of maturity, will depend on the capacity of society to move in unity. If this unity is not the attractive point, according to trialectics, humanity faces the danger that there is little time left in which to solve disagreements. Ichazo continues, in this interview:

"But now, in the time of our maturity what happens is that we don't have that much time. If we don't understand what we have to do now, we are dead, and everybody knows it." (INT 121)

Trialectical analysis identifies the up and down points of attraction for the current process of worldwide change as unity — taking humanity "up" to "metasociety" (BMP 108-09; INT 68-69, 99, 147-48, 169-70) or survival under new terms of understanding; and continued contradiction, leading "down" to humanity's destruction.

Part 4
Summary and Conclusions

Main differences

Dialectics and trialectics both offer principles for understanding the process of change. Both lay claim to a new logic, and both use their logic for understanding change in society as well as in the natural world. Everything is subject to the same laws in dialectics because everything is material. Everything is subject to the same laws in trialectics because it is part of the same objective reality; reality, however, goes beyond the material. Dialectics asserts that it accepts no metaphysical propositions. Metaphysical propositions, in trialectical theory, are unavoidable as soon as the human mind separates itself from reality by questioning it.

In dialectics, contradiction between opposites is the force behind change; in trialectics, equilibrium between opposites is that force. Opposition is fundamentally contradictory in dialectics; opposition is fundamentally complementary in trialectics. In dialectics, opposition builds to negation and the destruction of the old to produce the new; in trialectics, equilibrium is attracted to a pre-established point of change. There is no gradual appearance of the new in trialectics — change occurs only in jumps. In dialectics, gradual change produces the sudden leap of change.

The implication of the trialectical jump is that there is always a gap to cross before change occurs. In social process this means that there comes a point where we can no longer count on gradual progress toward a goal — we must jump to reach it. All the goodwill in the world will not bring unity to the human race; there must be a jump in the level of understanding and concomitant action.

Trialectical perspective

Trialectics and dialectics are both millenial, but dialectics would bring about its millenium by revolution (or at least by the progress of socialism to true communism), while trialectics asserts that man does not produce historical events. "We are the product of nature rather than the invention of our own criteria." (INT 168) The process of historical change, like the process of nature, occurs across pre-established points.

Summary and Conclusions, Continued

Possible developments

Trialectics suggests possibilities for analysis of social change, psychological development, and organic processes. It is our opinion that it offers a valuable alternative to the conflictual metaphors of change that do, indeed, seem to be the preferred explanations of social, psychological, and biological interactions. In a sense, trialectics is not so much a new viewpoint as one that we already have, but don't do much with. The guidelines of trialectics offer a way to start looking for evidence and possibilities of cooperative change, and of cycles that will help us identify where we are in relation to changes that we are only beginning to understand.

Table 1: The Laws of Trialectics

First law: mutation	Law of Mutation from One Material Manifestation Point (MMP) to Another MMP: a) In a mutation the equilibrium is internal, is function, and generally is pure, invisible action. b) The MMPs, the jumping points, are neutral points of retention of energy. c) We move in a universe with pre-established laws and points. d) The absence of function provokes contradiction which in turn struggles to find equilibrium that can only be resolved downward.
Second law: circulation	Law of Circulation or Law of Equilibrium Among Opposites: a) Inside everything is the seed of its apparent opposite. b) From the cosmic viewpoint opposites do not exist. c) From the cosmic viewpoint there are no collisions; there is circulation, that is, processes. d) In nature there are no accidents.
Third law: attraction	Law of Attraction of One MMP to Another Higher or Lower MMP or Law of Perpetual Movement of All Creation: a) Higher MMPs are subject to a smaller number of laws. b) Higher MMPs are more permanent but have a greater range, less internal movement and greater exterior expansion. c) MMPs are pre-established; they are not accidental. d) One MMP's attraction to another can be ascending or descending.

Source: Ichazo (1976)

Notes

[1] Contradiction the core

Lenin called the study of contradiction the "nucleus" of dialectics. *The Fundamentals of Marxist-Leninist Philosophy*. Moscow: Progress Publishers, 1974. p. 141.

[2] Intricacies of contradiction

See N. Lobkowicz, The principle of contradiction in recent Soviet philosophy, in J. Bochenski (Ed.) *Studies in Soviet Thought, Vol. I.* Dordrecht, Holland: D. Reidel, 1961; and P. V. Kopnin and I. S. Narsky, Materialist dialectics in the Soviet Union in the 50s and 60s of the twentieth century, in R. Klibansky (Ed.) *Contemporary Philosophy: A Survey, Vol IV*. Florence, Italy: La Nuova Italia, 1971, for a discussion of contemporary questions and changes in the doctrine of contadiction. Also see J. Lachs, *Marxist Philosophy*. Chapel Hill: University of North Carolina Press, 1967. p. 5, for the "inadequacy" of philosophical discussion on this point.

[3] Source

Marx, K. 1964. *Economic and Philosophic Manuscripts of 1844*, D. Struik (Ed.), trans. M. Milligan. New York: International Publishers.

[4] Source

Dühring's *Course of Philosophy*, now difficult to obtain, is quoted and criticized in F. Engels, *Herr Eugen Dühring's Revolution in Science (Anti-Dühring)*, trans. E. Burns. C. Dutt (Ed.) New York: International Publishers, 1939.

[5] Source

Instructional materials, advanced training, London, 1982.

[6] Time and change

This "given" is derived from Ichazo's various statements concerning change; from the statement, ". . . in the presence of time everything moves; everything is in change." (BMP 71-72); and from statements about a limit to time and a "beyond" change (BMP 37; and see Part 2 of this paper). Since there is a "beyond" of no movement, while there is movement in the presence of time, we infer: Change must occur so long as time is present.

[7] Source

Instructional materials, 3-month trainings, New York and San Francisco, 1972, 1973.

[8] Non-antagonistic contradiction

Lenin later added the concept of non-antagonistic contradictions as an explanation of how change would occur under socialism, when the material basis of class conflict had been abolished.

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Abbreviations used

Abbreviations are used in the text of this paper for the sources most frequently quoted in the comparison of dialectics and trialectics. These abbreviations are:

BMP (see Ichazo 1982)
FM (see Bochenski 1963b)
FML (see Progress Publishers 1974)
HP (see Ichazo 1976)
INT (see Arica 1982).

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Chapter 5
Trialectics Within the Conversation of Contemporary Philosophy

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The Need for a Pragmatic Metaphysics

The purpose of philosophy

"Philosophy recovers itself when it ceases to be a device for dealing with the problems of philosophers and becomes a method, cultivated by philosophers, for dealing with the problems of men."

— John Dewey

"Philosophy will begin working in society when we begin understanding that the challenge we face is precisely what will make us jump to another level of understanding, another level of humanity."

— Oscar Ichazo

Understand the *Zeitgeist*

Hegel (1952, 11) believed that philosophy can be partly defined as "its own time apprehended in thought."In the theory of trialectics, Oscar Ichazo (1982, 2) has proposed a new philosophy which has been described as "a method and a theory original and complete in itself, as it is the outcome of a new point of view which is the result of a new logic which can deal with those problems currently emanating from those scientific discoveries dating from the beginning of this century."

In light of Hegel's view of the nature of philosophy, then, a fully adequate account of trialectics should begin with an attempt to understand the nature of our present historical epoch and a demonstration of the ways in which trialectics reflects and captures the *Zeitgeist* in thought. To embark on such a task, however, would lead far beyond the scope of an essay.

Understand the *Zeitgeist* (continued)

Perhaps one of the most striking recent changes in attitude has occurred on the fringes of physics as well as the other sciences, where we hear repeatedly of the emerging "holistic point of view" (Horn 1983), and a "holographic" or "New Age" paradigm (Wilber 1982). I can do no more in a paper of this scope than to refer to a few representative figures in science and philosophy and demonstrate the ways in which trialectics relates to their efforts and preoccupations. In this way we will see just how Ichazo's trialectics fits into the conversation of contemporary philosophy.

Capra's view in *Turning Point*

One of the leading figures in the popularization of the holistic point of view in the sciences is the physicist Fritjof Capra, author of *The Tao of Physics* (1975). Capra's new book, entitled *The Turning Point: Science, Society, and the Rising Culture* (1982), presents the thesis that the troubled state of affairs which currently exists in our world as a result of such crises as the exploitation of the earth's natural and energy resources, pollution, disease, world hunger, war, unlimited nuclear arms production, etc., can to a large extent be traced to the way in which we habitually think about things. That is, according to Capra, our present conceptual paradigm is still the one formulated in the 17th century under the influence of Descartes and Newton.

This paradigm Capra describes as dualistic, mechanistic, and reductionistic. As Stephen Jay Gould (1983) writes in his review of *The Turning Point*, according to Capra, "This reductionist strategy for explanation has been allied with a conceptual machismo:belief in continual progress and growth by exploiting the earth and all its life (which we therefore view as separate from man and available for dominion), and the basic idea that we learn in order to control and manipulate ('knowledge is power,' as Bacon proclaimed)."

In order to prevent the further deterioration of the present condition of our planet, Capra suggests we abandon the outdated Cartesian world view in favor of one that is more consistent with recent scientific developments in physics and biology, and which is characterized by a holistic, ecological, unitary systems point of view.

Gould expresses Capra's message in this way, "We must recognize inseparable union and interaction as basic realities. Complex systems, not separated building blocks, must be our units of explanation. We must immerse ourselves in nature and work with it, not separate it in order to exploit it."

Gould's critique of Capra

Gould is indeed sympathetic to the holistic, non-reductionist, and hierarchical point of view advocated by Capra, and states that "This enormously right-minded general theme, here somewhat caricatured for brevity, surely wins my approval. My own recent work in evolutionary theory follows Capra's prescription." Yet, although Gould endorses Capra's general approach, he finds two weaknesses in Capra's exposition. The first of these Gould claims cannot be attributed directly to Capra, but rather is inherent in any attempt to break free of an entrenched mode of thought and construct a new one. Gould writes, "It is always easier to identify problems than to construct solutions. If Capra's description of the holistic and ecological paradigm lacks rigor and richness, well, many people are struggling with it — and no one has yet succeeded, so why should we expect more of him?"

However, Gould does feel Capra to be at fault in the way in which he presents his thesis and in the reasoning he employs in establishing it. All this Gould finds "simplistic and even anti-rational (I think intentionally) at too many points."Gould believes that Capra has not provided the needed "well-formulated substitute for Cartesian thinking" but rather, "At best, we get hints from people who have worked out a holistic system only half way (von Bertalanffy), or in an oracular fashion (Gregory Bateson), or in the pop mode (Arthur Koestler)."

Ichazo's trialectics as a holistic system

The moral of all this seems to be that due to the theoretical and practical crises facing the present moment of history, we require a *well-formulated* and *fully* worked out holistic system. Yet, only if such a system were grounded in firm reasoning could it replace the outmoded Cartesian-Newtonian conceptual paradigm. Although Gould believes this task has yet to be accomplished, I believe that Oscar Ichazo's theory of trialectics is a strong candidate, as it provides us with the necessary coherent systematization of the holistic point of view.

Ichazo accomplishes this in *Between Metaphysics and Protoanalysis* by uncovering the necessary logical form of reasoning which best conceptualizes this point of view. In addition, Ichazo's theory provides a much more sophisticated and elaborated analysis of the conceptual paradigm Capra attacks, as well as the nature of the reasoning behind it.

Based on historical development of reason

Ichazo's presentation of trialectics is based on the historical development of reason. He describes this evolution in terms of shifts in the codified set of underlying laws which have distinguished each major conceptual paradigm since Western philosophy began in ancient Greece. Ichazo first depicts Aristotle's codification of the laws of classical logic as representative of the paradigm of reason in that time period, a paradigm which began to break down in the Renaissance with the growth of modern science and modern civilization.

The paradigm which replaced Aristotle's, under the influence of Francis Bacon's *Novum Organum,* was one which no longer reflected a "static" world, such as classical formal logic implies, but rather a changing and expanding world in which progress was unlimited. Each new scientific discovery and each new colonization of land led to another and it was assumed this progression was infinite. This world view was finally codified in the temporal logic of dialectics by Hegel and further clarified by Engels. The dialectical way of thinking seemed to have accurately grasped its time in thought, a time marked by the industrial revolution, competitive nationalism, and expansionism.

Current influence of dialectical thinking

According to Ichazo, we are still under the sway of dialectical logic and we will continue to operate in such a conceptual framework to our own detriment; it has already led us perilously close to the brink of disaster. What Capra describes as the Cartesian-Newtonian paradigm, Ichazo calls the dialectical point of view. With this point of view we are compelled to think dualistically and in terms of opposites as well as competitively, seeking more and more for ourselves without regard to others or to the environment and without acknowledging limitations to material growth and progress.

In agreement with Capra, Ichazo (1982, 62) believes that our current world crisis is a reflection of a type of reasoning which is no longer appropriate for our time period. He believes that "It is obvious that we need a new system of logic. Physics, biology, chemistry, and the new electronic technology are forcing us to discover a new logical system. In this theory we say that the discovery of the 'logic of the unity' is the third and most dramatic of the three crises that humanity has had, since it enables its entry into maturity."

Trialectics as philosophy of the turning point

If the ancient Chinese wisdom of the I Ching which Capra cites is correct, namely, that "After a time of decay comes the turning point," and if Hegel's definition of philosophy is accurate, then trialectics may well serve as that philosophy which apprehends its own time in thought, which in this case becomes the time of the turning point.

Trialectics as a form of pragmatic metaphysics

Yet Ichazo believes that the role of philosophy is to do more than just apprehend its own time in thought; it is to help affect its time for the better through the proper application of the proper thought for its time. Although Ichazo speaks of trialectics as a form of metaphysics, it is not an a priori rationalism but rather one which is rooted in the sciences. He contends (1982, 24) that ". . . metaphysics is not merely a point of intellectual analysis, but an indispensable element of thought which can change our lives. It is from this view, from the sense of the practical that we shall speak. It has now become clear that the crisis in which we live serves as the prelude for a radical change."

Such a conception of philosophy is reminiscent of the metaphilosophy of the "pragmatism" movement in American philosophy. These philosophers also sought to bring philosophy to bear on the problems and practical concerns of our culture in the hope that through philosophy our lives could be changed for the better. Such a view of philosophy, however, seems antithetical to the conception which contemporary analytic philosophy in this country has had of itself. Of contemporary Anglo-American philosophy, Morton White (1955, 17) has written, ". . . most philosophers in the logico-analytic tradition shy away from the issues of public and personal life, from the problems of culture and practice, as though they are of no importance to philosophers."

However, recent developments within contemporary philosophy indicate that the "self-image" analytic philosophy has had of itself may be fading as the pressure for an alternative self-image grows. Philosophy itself may have reached its own "turning point." Thus, it is the nature of contemporary philosophy in America and the relation it bears to trialectics which will now become the focus of my discussion.

The Fortunes of Analytic Philosophy

No single current philosophic context

I must admit that I would be acting in bad faith if I pretended to give a complete account of what is happening in the world of contemporary philosophy. In restricting my account to contemporary *academic* philosophy, I must exclude important trends in philosophy outside the academic world.

Even so, the academic world itself resembles William James' "pluralistic universe." Such a world does not easily conform to a monistic description. Presently there is no longer one dominant school of thought, no one way philosophy is done, no one set of problems philosophy addresses, no one view of what philosophy is. Actually, there really is no uniform way to describe the nature of philosophy as a whole during the first three quarters of the 20th century, although there have been certain dominant trends.

The dominant trend in the Anglo-American tradition became particularly tyrannical in its treatment of other schools of philosophy. This dominant group of philosophers practiced what has come to be known as "analytic philosphy" even though within that very classification there has been significant variety. What almost all analytic philosophers have had in common is the distinctive *way* in which they philosophize and the particular matters they believed philosophy is meant to deal with. For a time, any philosopher who did not fit into the image of what analytic philosophy deemed a philosopher is and does became an outcast and was ignored, for the most part, by the majority of professional philosophers, since those outcasts were not "really" philosophers.

Analysis of analytic philosophy necessary

In order to better understand the contemporary academic philosophical world into which trialectics enters, we must go into more detail in describing the nature of analytic philosophy, its genesis, its relation to other types of philosophy which have existed alongside it, and its present uneasiness concerning its self-image.

Such an analysis has been performed by Richard Rorty, former Chairman of the Department of Philosophy at Princeton and former President of the American Philosophical Association, in two recent books (1979, 1982), works which themselves must be understood within the conversation of contemporary philosophy in order to fully understand that conversation.

Current philosophic impasse traced to Descartes

In *Philosophy and the Mirror of Nature*, Rorty traces the origins of the metaphilosophical paradigm operative in modern analytic philosophy, which he believes to be flawed, back to the 17th century and particularly to Descartes. Descartes is cited as the thinker who made the greatest contribution to the theory that our knowledge of the external world is problematical, for it was Descartes who did the most to separate the mind from that world. To Descartes Rorty also attributes a "neurotic obsession" with certainty and with the notion that all knowledge must be similar in nature to the "self-evident" certainty of mathematical knowledge.

The main preoccupation of philosophy since Descartes became the problem of how *certain* knowledge of the world is possible given the "bifurcation" of a mind-which-knows from a world-which-is-known. According to Rorty, this idea of the mind as a "mirror of nature" which does or does not accurately "reflect" the external world, and of philosophy as the discipline which analyzes this mirror and the accuracy of its reflections, was further extended by Locke's attempt at a "theory of knowledge."

The rise of epistemology

The idea of philosophy as the theory of knowledge received its most powerful expression in Kant's *Critique of Pure Reason*. Ever since its publication, except for the Hegelian school, philosophy has thought of itself as that endeavor which can stand above the culture and the other academic disciplines by acting as a judge of what can be said to be "known," due to its privileged possession of the techniques which yield certain knowledge and its knowledge of what constitutes an accurate "representation" of reality. Philosophy was no longer thought of as participating in the conversation of the culture, but rather became the arbiter of that conversation, taking its task to be one of setting the proper ahistorical, epistemological foundations for all knowledge.

Anglo-American philosophy strives to become "foundational"

This ahistorical, epistemologically foundational view of philosophy became further entrenched as a metaphilosophy during the early 20th century with the rise of science and modern logic. As it was believed that the traditional brand of a priori, rationalistic metaphysics, exemplified by the Absolute Idealists, was to be superseded by the empirical discoveries of science, philosophy continued to strive to be foundational by becoming the science of the sciences.

Anglo-American philosophy strives to eliminate metaphysics

This view of philosophy found its high point in logical positivism with its distrust of metaphysics and its belief that philosophy is to be solely a critical and formalistic enterprise. This movement, combined with the trend toward linguistic analysis of philosophical problems (in an effort to show how muddled problems can be diffused by simply uncovering their poor grammatical structure) strengthened the aversion in philosophy toward metaphysical issues. Metaphysics came to be thought of as an impossible task. Metaphysical problems were unmasked as linguistic confusions and once they were straightened out grammatically they were found to be impossible of empirical verification.

"Foundations" hinge on absolute certainty of experience

In its positivistic stage, philosophy believed its primary critical role was that of monitoring the efforts of science. It did this through the analysis of its methods and logical structure, as well as through the attempt to provide the epistemic justifications for claims to scientific knowledge by establishing the empirical *foundations* of those claims. These empirical foundations were to be found in the form of the "directly given" in experience, since the "given" was deemed to be that which is most certain.

Confined within the talk of "sense-data," "protocol sentences," and the like, as well as within *post*-positivistic jargon, philosophy has become an enterprise so formalized and technical that to those of the other academic disciplines, as well as to the common man, it has become remote and unapproachable.

Anglo-American philosophy and linguistic analysis

The hybrid of logical positivism with linguistic analysis became known as "analytic philosophy," an enterprise which, for the most part, saw its role as that of a critic of all who use language in a claim to express truth or knowledge.

Actually, much of analytic philosophy is only of interest to other analytic philosophers. In fact, according to Rorty, to be a good philosopher one did not need to be able to say anything interesting at all as long as what one did say was said cleverly and argumentatively.

Due to its self-determined critical propensities, philosophy in practice became almost exclusively the art of argument, the art of finding clever counter-examples to whatever timid substantive claim was put forth by another philosopher, rather than a cooperative effort at finding, if not truth, than at least solutions to practical problems.

Schism in Western philosophy

These attitudes which marked philosophy in the Anglo-American tradition brought about a major schism in this century between that tradition and the "continental" philosophical tradition in Europe. According to Rorty, continental philosophy in this century remained Hegelian in the sense of its being historicist in orientation, with the exception of Husserl, who for most of his life attempted to provide firm foundations for knowledge through the disciplines of phenomenology. The continental tradition, therefore, does not share the view of philosophy that has been dominant in the English-speaking countries as an ahistorical, foundational enterprise, uninfluenced by the concerns of its time period and resolved never to become involved in the process of its culture.

Therefore, during the time when analytic philosophy was secure of its self-image and had definite sets of problems which it believed it was the job of philosophers to address, continental philosophers, since they shared neither that self-image nor that set of problems, were generally ignored. This was the case with any philosopher or philosophy, continental or not, that was outside of analytic philosophy's camp.

Rorty's evaluation of recent philosophical trends

Rorty, however, believes that at present analytic philosophy has reached a stage in its development where this parochial attitude is out of place. Besides providing his own critique of the Cartesian mind-body dualism and the explanatory reductionism which brought about the conceptual paradigm presently operative in analytical philosophy, Rorty cites examples from within the tradition of analytic philosophy itself which undermine its previous positivistic theoretical assumptions. In his article, "Philosophy in America Today," Rorty summarizes his account of analytic philosophy in the following way:

"1. Analytic philosophy started off as a way of moving from speculation to science — from philosophy as a historically based discipline to philosophy as a discipline centering around 'logical analysis.'

2. The notion of 'logical analysis' turned upon itself, and committed slow suicide, in Wittgensteinian, 'ordinary language,' Quinean, Kuhnian, and Sellarsian criticisms of the purportedly 'scientific' vocabulary which Reichenbach, e.g., had taken for granted.

Rorty's evaluation of recent philosophical trends (continued)

"3. Analytic philosophy was thus left without a genealogy, a sense of mission, or a metaphilosophy. Training in philosophy turned into a sort of 'casebook' procedure, of the sort found in law schools. Students' wits were sharpened by reading reprints of articles by currently fashionable figures, and finding objections to them. The students so trained began to think of themselves neither as continuing a tradition nor as participating in the solution of the 'outstanding problems' at the frontiers of a science. Rather, they took their self-image from a style and quality of argumentation. They became quasi-lawyers rather than quasi-scientists — hoping an interesting new case would turn up." (Rorty 1982, 227)

Analytic philosophy analyzes itself

Rorty's account cites such analytic philosophers as Wittgenstein, Sellars, Quine, Kuhn, and Feyerabend as having thrown into question the positivistic theoretical assumption that knowledge does, or must have, unshakable empirical foundations. Their critical examinations of the attempt to establish a purely empirical "observation language" based on the "directly given" in experience and untainted by our theoretical structures proved fatal to the positivistic enterprise. These examinations have resulted in the view that it is impossible to separate theory from empirical observation, or our conceptual structures from our perceptual experiences and beliefs. Therefore, if all observation is theory-laden, and if our conceptual schemes determine the kind of experiences we have and the beliefs generated from such experiences, then there can be no neutral ground from which to judge what does or does not count as "knowledge." Knowledge must be evaluated from within the holistic web of our beliefs and under the conceptual framework we have adopted.

If, as Sellars has maintained, the idea that there is something "given" to us in experience which is unfettered by interpretation is a myth, then there is no reason to believe that philosophy will ever provide us with unshakable epistemic foundations which the logical positivists and empiricists believed were necessary to ground our knowledge. The traditional epistemological conception of philosophy dominant since the days of Descartes should at last be abandoned.

Pluralism need not entail relativism

For Rorty, then, the move that contemporary analytic philosophy should make is away from epistemology and toward hermeneutics, which he seems to favor at least in part due to the relativism that often accompanies it.

Pluralism need not entail relativism (continued)

Yet, while we may agree with Rorty that it is necessary for philosophy to abandon its epistemological preoccupations and to return its voice to the conversation of our culture, we need not accept the *relativistic* direction he suggests we wander into. There are alternative directions other than relativism in which to turn after we break free of the philosophical obsession with establishing the epistemological foundations for knowledge.

To suggest that philosophy continue down *one* path where only relativistic hermeneuticists and other deconstructive philosophers are allowed to pass and where constructive metaphysicians are not, would be to repeat one mistake of the positivist stage of analytic philosophy's history. This mistake, which Rorty himself has condemned, is philosophical parochicalism.

The plea for pluralism in philosophy as a guard against the tyranny which allows only a small number of "real" and "serious" problems of philosophy and ways of philosophizing to prosper should be attended to by all parties.

Pluralism without relativism

Fortunately, other writers in contemporary analytic philosophy, of whom Robert Nozick of Harvard is perhaps the most notable, have recently advocated pluralism within philosophy.

Nozick's defense of pluralism is based on the notion that there can be no neutral starting point from which to frame philosophical explanations. Nozick writes,

"The treatment for philosophical parochialism, as for parochialism of other sorts, is to come to know alternatives. We can keep track of the different philosophical views that have been put forth and elaborated; we can pay attention to foreign traditions and their diverse viewpoints, to the special slant of these traditions on our questions, both the different ways they pose their most nearly equivalent questions, and the different answers they offer." (Nozick 1981, 19)

Nozick's view concerning pluralism, however, does not necessarily involve the relativism found in Rorty's view. Nozick does not rule out the possibility that philosophical progress can be made, but rather objects to the position once held by analytic philosophy that its methods and set of problems were the only methods and problems worthy of philosophical attention.

Philosophy returns to the conversation of mankind

Such objections within the philosophical community to its own parochialism make the probable treatment of trialectics at the hands of contemporary philosophers a matter of less concern than it would have been a decade ago. Such concern hinges on the notion that contemporary analytic philosophy is antithetical to the type of philosophy trialectics seems most to resemble, namely, the Hegelian, continental, historicist type of philosophy. Actually, considering Rorty's influence among academic philosophers, the interpretation he offers of analytic philosophy, and his own belief that philosophy should view itself as once again belonging to the conversation of mankind, may prepare the ground for serious examination of Ichazo's theories.

However, we must note that although Ichazo's philosophical approach is a historicist one, he does not share the relativism that Rorty advocates. As Isenberg (1983) has pointed out, from the viewpoint of trialectics, Rorty's own relativistic point of view would seem to be a *dialectical* one as opposed to the static, ahistorical point of view of the positivists, a point of view which seems to adopt the *formal logic* paradigm of identity. According to Isenberg, for Rorty, "Truth changes with the consensus — a prime example of the first law of dialectics that identity is constantly changing. Indeed, Rorty sees the flow of philosophical conversation proceeding by stages of opposition, fulfilling the second law. As a relativist, however, he does not necessarily see the process resulting in any kind of 'progress.'"

Philosophy's new role

Ichazo would agree with Rorty's suggestion that, as an alternative to the self-image which analytic philosophy has had of itself, philosophy adopt a more "historical" and "pragmatic" view of itself. That is, philosophy should not view itself solely as a discipline which attempts to provide epistemological foundations for knowledge, thereby ignoring important metaphysical and practical issues, particularly when the two coincide.

Philosophy should adopt a view of itself which situates itself within the conversation of our time, not as a discipline which is separate and removed from it. However, unlike Rorty, for Ichazo, relativism is not the necessary result of such a view. Nor can metaphysics in general be cast out entirely. That is, philosophy must attempt to construct metaphysical foundations when the implicit, if not explicit, metaphysical foundations of its time period no longer seem to be accurate either theoretically or practically.

The Fortunes of Analytic Philosophy, Continued

Philosophy's new role (continued)

Trialectics, then, is *metaphysically* foundational, responding to the theoretical and practical needs of our time as they are assessed by such scientists as Capra and Gould, although it is not *epistemologically* foundational in a non-pragmatic way. In other words, the foundation that trialectics provides is a metaphysical one upon which a new conceptual scheme can be built and which will serve the needs of our science and culture.

Yet the theory does not waste philosophical energy in the attempt at providing the foundational, epistemic justifications which will "ground" and secure all our claims to "know." Such an attempt at establishing epistemological foundations would not be a pragmatic pursuit, particularly since it is highly doubtful whether it can ever succeed, and if it could, whether it would actually be helpful to our philosophical understanding.

Dewey's Approach to Logic Reassessed

Renewed interest in American pragmatism

Since Rorty's presidential address to the American Philosophical Association in 1979, in addition to the marked increase in interest in continental philosophy within academic philosophy, there has been a renewed interest in the American pragmatists. Indeed, in *Philosophy and the Mirror of Nature*, Rorty sees Dewey, Heidegger, and Wittgenstein as the three most important philosophers of the 20th century.

That an analytic philosopher should give this distinction to Dewey and Heidegger is significant and again indicative of the shifting winds of philosophical opinion, especially if we consider the extent to which Dewey was ignored by analytic philosophy after World War II and that Heidegger's thought was long considered the best example of nonsensical metaphysics produced on the European continent.

James and Dewey as forerunners

Dewey is cited as perhaps the most important of the three aforementioned philosophers, partly due to his call for a "reconstruction in philosophy" which would redefine the role of philosophy within contemporary culture. Rorty believes that the recent internal criticisms within analytic philosophy have brought it to a point where it resembles the more historically oriented continental hermeneutics and, in fact, that both analytic and continental philosophy have reached a point where they seem to hold views that were already expressed in the pragmatism of James and Dewey.

James and Dewey as forerunners (continued)

Rorty (1982, xviii) writes, "On my view, James and Dewey were not only waiting at the end of the dialectical road which analytic philosophy traveled, but are waiting at the end of the road which, for example, Foucault and Deleuze are currently traveling."

What unites Dewey, Heidegger, and Wittgenstein, according to Rorty, is their emphasis on the deconstruction of the foundational mode of philosophy centering around epistemological issues. The importance of the pragmatists, however, is in their attempt at providing a *positive* role for philosophy after the negative role of deconstruction. On the relation between Dewey and the French thinker Michel Foucault, Rorty (1982, 208) writes, "Although Foucault and Dewey are trying to do the same thing, Dewey seems to have done it better, simply because his vocabulary allows room for unjustifiable hope, and an ungroundable but vital sense of human solidarity."

Relevance of Dewey

That Dewey's ideas and pragmatism itself are being considered quite seriously as analytic philosophy struggles for an alternative self-image is evidenced by the recent presidential address to the American Philosophical Association by John E. Smith of Yale. Smith's recent address, entitled "The New Need for a Recovery of Philosophy," begins this way:

"The first note to be struck concerns the underlying spirit of this occasion. I believe that Whitehead was profoundly right when he wrote in *Adventures of Ideas* that 'philosophy is not — or at least should not be — a ferocious debate between irritable professors'. Regardless of the undeniable differences in our points of view and approaches to philosophy, the present situation calls for a recovery of our subject in the form of a concerted attack upon problems arising from our efforts to define and sustain a life that is human as over against a war between philosophers largely bent on scoring points in an academic intelligence test." (1982, 5)

Smith suggests the new self-image that philosophy should adopt should be one consistent with the heritage of the American pragmatists. He writes (1982, 7), "More than sixty years ago John Dewey wrote an essay about his diagnosis of the contemporary philosophical scene entitled, 'The Need for a Recovery of Philosophy.' It is from this essay that I adopt my title.There he made a plea for a return to a direct approach to philosophical issues as they arise from conflicts and problematic situations encountered in the moral, social, political and scientific contexts of American culture.

Relevance of Dewey (continued)

"Dewey pointed to the futility of philosophical preliminaries as represented by the continuing emphasis on the theory of knowledge, a topic he viewed with suspicion not only because it seemed to postpone the discussion of other important issues, but because a problem of knowledge *uberhaupt* he regarded as stemming from a non-empirical conception of experience."

Smith acknowledges that "Dewey's plea fell on deaf ears and . . . [philosophers] continued to focus on the theory of knowledge, on logic, semantics and language." Smith thus believes that "In view of these developments, the fact that Dewey's plea for a recovery of a philosophy in touch with the problems of the culture went unheeded makes it necessary to advance that plea once again."

Return of metaphysics to philosophical discussion

Although Smith shares Rorty's view that philosophy should become pragmatic and hence involved in solving the problems of the culture, Smith does not share Rorty's relativism nor his anti-metaphysical attitude. Smith's notion of philosophy then seems to be quite close to that of Ichazo's. In fact, Smith pluralistically opposes any restriction on the questions that philosophy should or should not be interested in, particularly those metaphysical questions that often prompt us to philosophical reflection, such as the nature of our identity, the structure of the universe, and our place in that universe.

Not to permit philosophers to seek answers to such questions he considers an unjustifiable limitation, since such questions simply will not go away as long as there is a humanity for whom they are concerns. One result of professional philosophers refusing to help humanity answer such questions is that others take on this role, and do so often without the benefit of what a firm knowledge of the philosophical tradition has to offer.

On this issue Smith writes, "The decline of philosophy as an influential voice in the intellectual exchange within our culture has been the result of several questionable conceptions that have dominated much of modern philosophy since the seventeenth century. Not least among the consequences of this loss of an audible voice has been the migration to other fields of study of many questions upon which philosophers used to concentrate — the place of man in the cosmic order, the status of human purpose in a seemingly mechanical universe, the basic categories of modes of being, the problem of God and what an ancient philosopher called 'the things that matter most.'

Return of metaphysics to philosophical discussion (continued)

"We should not therefore be surprised to discover that literary critics, intellectual historians, novelists, psychiatrists, economists and those in the biological sciences — to name but a few — are capturing the imagination of the public through discussion of many philosophical issues and concerns."

To verify Smith's point we need only point to our discussion of physicist Fritjof Capra's *The Turning Point*. It is a work by a scientist which deals with the philosophical issues of shifting conceptual paradigms and the dreadfully important need to articulate a new one for this epoch in order to avoid much of the practical, societal dangers of an outmoded paradigm. It is also appropriate to point out that the problems that Gould found in Capra's presentation were philosophical: poor, unsophisticated exposition and the lack of sustained logical reasoning in the formulation of his thesis. Thus Smith's insightful remark that "The requisite philosophical skill and insight required for treating reflective questions is often lacking in those who are unaware of what is to be learned from the heritage of philosophical thinking we possess," is well taken.

Whitehead Rediscovered

Return of the "things that matter most" to philosophical discussion

It would seem that Smith is not only in sympathy with the way in which Dewey and the pragmatists viewed the role of philosophy but, as is evident from the opening passage of his address, also with the way Alfred North Whitehead viewed philosophy. Whitehead believed philosophy should address those questions concerning God, man, and the world, that is, "the things that matter most," and that they should be dealt with in a manner reflective of the time in history. In our case, that would mean that those questions must be dealt with in terms of the present state of our science.

It should come as no surprise, then, that Whitehead's process philosophy or "philosophy of organism" is being increasingly invoked by the thinkers involved in the "New Age" and "holographic" paradigms which have grown mostly out of the recent work in neurobiology by Karl Pribram and in physics by David Bohm. (See Wilber 1982)

The holistic world view such discoveries seem to engender is said to bear striking resemblances to the "perennial philosophy" of the spiritual and mystical traditions of both the East and West — a point Fritjof Capra has frequently pressed — and which Whitehead's own system seems to resemble in many ways. And, as mentioned above, it is also the world view that trialectics has provided the logical structure for.

Return of coherent general picture of world

Whitehead, therefore, also saw the need for a new cosmology and world view which would take into consideration the advances of 20th century science rather than continuing to operate solely with conceptions inherited from the 17th century. Much like Ichazo, he believed metaphysics to be a useful undertaking if it is not an a priori dogmatic affair, but rather is conceived of as an attempt at formulating a coherent general picture of the world out of the discoveries of science as well as out of pure philosophical reflection. For Whitehead (1929, vi), "It must be one of the motives of a complete cosmology to construct a system of ideas which bring the aesthetic, moral, and religious interests into relation with those concepts of the world which have their origin in natural science."

Whitehead would have also agreed with Smith's (1982, 18) belief that "If we do not convey the impression of being earnestly in pursuit of the truth, of trying to find out what there is and where we fit into the scheme of things, we must not expect our readers and hearers to be either interested or moved."

Philosophy should strive to unity science and religion

In fact, this seems to be part of the point Whitehead (1929, 23) makes in his own view of philosophy and its effectiveness in the culture when he writes, "Philosophy frees itself from the taint of ineffectiveness by its close relations with religion and with science, natural and sociological. It attains its chief importance by fusing the two, namely, religion and science, into one rational scheme of thought."

Perhaps it is for this reason that both Whitehead's and Ichazo's points of view resemble the emerging holistic point of view and that both philosophers see reality as a hierarchical and holistically interconnected organic system undergoing a continually evolving dynamic process.

The idea of philosophy as attempting to unify science and religion is also found in the pragmatist William James. In his *Varieties of Religious Experience* (1961) in particular, James suggests that philosophy act as the "science of religion" in the quest for scientific understanding of the empirical facts of the religious experience. The program which James suggests seems to have influenced the development of Ichazo's own scientific and rational approach to mysticism. In fact, Ichazo (Arica 1982, 7) mentions that as a student "all the while I was reading all the philosophy I could get ahold of —especially William James."

Ichazo's approach congruent with these trends

We may then conclude that if Smith's presidential address to the APA does not fall on deaf ears, and if Ichazo can be seen in the spirit of Whitehead and the pragmatists, James and Dewey, he should be a welcome voice in the conversation of contemporary philosophy. For certainly Ichazo's proposal of trialectics as a pragmatic metaphysics which attempts to deal with both the issues and concerns of our present science and culture would seem to be in line with the direction philosophers like Smith believe philosophy should take. This basic similarity in point of view is evident when Ichazo (1982, 24) states that "We must agree right now that metaphysics is a subject which interests not only scholars; it is a fundamental concern for all of us. We must define our identity in such a manner that it serves us in a practical fashion, so that we approach the serious business of reality."

Such an attitude is certainly reminiscent of the pragmatists whom analytic philosophers, led by Smith and Rorty, among others, are beginning to reexamine and appreciate. For Rorty (1982, 175), the worth and attraction of the pragmatists is due to the fact that "They grasped our time in thought. We did not change the course of the conversation in the way they suggested we might. Perhaps we are still unable to do so; perhaps we never shall be able to do so. But we can nevertheless honor James and Dewey for having offered what very few philosophers have succeeded in giving us: a hint of how our lives might be changed."

Ichazo and the comprehensive approach

Capra argues that a holistic point of view will arise from the fusion of scientific knowledge with Eastern religious philosophies. He considers this point of view necessary for curing our contemporary ills since it can work a change in each of us individually. If he is right, then the availability of an appropriate logic will greatly improve the effectiveness of such a point of view in facilitating the necessary changes. As Ichazo states:

"From here on we can see why the explosion of interest in spiritual matters in our time makes so much sense, and why it is fundamental to our survival.

"What we propose here is that a better comprehension of our surrounding universe will easily take us to a point of peace and freedom for all, and this is not a simple declaration of goodwill, which we all have, for even though we all have it, we still live in an excessively dangerous world.

Ichazo and the comprehensive approach (continued)

"Only a common logic that works in our surrounding universe, that works in society, and that works for individuals, will achieve the real purpose of history — to accomplish happiness for all." (1982, 64-65)

Some might balk at such an optimistic belief in times which seem to justify nothing but pessimism. But if it is true that "after a time of decay comes the turning point" (I Ching), then perhaps there is a balanced realism which justifies the optimism of such a belief. Thus, it seems that now philosophy has the opportunity not only to grasp its own time in thought, but to affect its own time through thought, by helping to bring about the turning point.

As Dewey (1931, 8) wrote, "Thus, philosophy marks a change of culture. In forming patterns to conform to in future thought and action, it is additive and transforming in its role in the history of civilization."

It is my conviction that trialectics can perform that transforming role in our civilization and thus change our culture for the better, hopefully before it is too late and we are left with a civilization hardly worthy of the name.

Notes

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Chapter 6
Trialectics and Formal Logic

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Metaphysical Foundations for Thought

Logic as metaphysical foundations for thought

Trialectics has been proposed by Oscar Ichazo as a new philosophical theory based on a new point of view resulting from a new logic. This new logic has generally been presented in contrast to two previously codified systems of logic, namely, the logic of Aristotle or "formal logic," and the dialectical logic of Hegel, as criticized by Marx and then systematized by Engels and other Marxist thinkers. In such a context, it becomes apparent that "logic" is understood by Ichazo in a metaphysical sense, that is, as the laws that either *describe* being as such, or *prescribe* the proper manner in which to conceive of being as such.

Certainly Aristotle understood his logical laws in this metaphysical sense and Hegel's criticisms of Aristotelian logic arise out of metaphysical considerations. Hegel believed that the three laws of Aristotle, or what have come to be known as the "Laws of Thought," i.e., the laws of identity, contradiction, and excluded middle, could not accurately account for reality. In Hegel's analysis Aristotle's principles describe "being" in a static manner and were unable to account for change and the process of time.

Ichazo's conception of logic is equally metaphysical, since the laws of trialectics are an attempt at describing being as such, or prescribing the most coherent way of thinking about being as such. Like Hegel's, Ichazo's is also a historical approach. He sees the development of metaphysical reasoning expressed in the sequence of codified logical laws: Aristotelian-Scholastic, Hegelian-Marxist, trialectic.

Metaphysical Foundations for Thought, Continued

Logic as rules of thought

That Aristotle conceived of his logical principles as metaphysical has sometimes been overlooked. Their metaphysical status has been obscured at least in part by their also serving as a "formal" system, that is, as propositions which are true in virtue of their syntactic form and independently of their content. Although few philosophers since the Schoolmen have accepted the laws of thought as metaphysical principles, they were retained nonetheless as formal principles and hence often referred to as *the* laws of formal logic.

To refer to Aristotelian logic as "formal logic," in the sense that these principles are to be interpreted not metaphysically but rather as the only logical laws of propositions true by virtue of their form, was scarcely problematical before the end of the last century. Indeed, up to that time very few advances were made in the formal logic of propositions.

However, in the past 100 years such logicians as Frege, Russell, and Wittgenstein made more advances in the formal logic of propositions than were made in the previous 2500 years. On the basis of this work, it is no longer believed that a viable formalized system of logic can be formulated with these three principles as the *only* axioms. In fact, when these principles are used in a formal system of logic as in, for example, the basic propositional calculus, they are stated in a completely different manner than the way they are stated in Aristotle's logic.

Therefore, one may be inclined to believe that any modern criticism of formal logic which is based on just the three laws of thought in the manner stated by Aristotle is treating formal logic in too simplistic a manner.

Formal Logic and Metaphysical Logic

Separate two meanings of formal logic

This would be true, of course, only if "formal logic" is taken to be *only* the three laws of Aristotle, and also taken in a *non-metaphysical* and *non-historical* way. If what is termed "formal logic" is actually meant to refer just to "traditional"(classical Aristotelian) logic, then the belief that a discussion or criticism of this logic would serve as a purely formal criticism of all kinds of logic, including modern symbolic or mathematical logic, which also falls under the heading of "formal" logic, would appear to be incorrect.

Separate two meanings of formal logic (continued)

One would need additional philosophical or meta-theoretical reasons for conducting a discussion of modern symbolic logical systems solely in terms of the three traditional laws of thought, since these laws are no longer the *only* axioms of modern formalized logical systems. This issue will receive more extended discussion further on in this paper.

However, if one were to take "formal logic" as referring simply to Aristotle's logic with all the metaphysical notions which he attached to his logic, and *not* to modern formal logic, which is basically mathematical in nature and divorced from any direct metaphysical commitments, then one would be justified in discussing and criticizing Aristotelian logic from a metaphysical and historicist point of view.

Confusion of two meanings of formal logic

Unfortunately, the need to distinguish the inherent historical and metaphysical aspects of Aristotelian logic from the "merely formal" aspects of this logic, and also the need to distinguish between those "formal" aspects of Aristotle's logic and *modern* formal logic have not always been clearly acknowledged. This lack of clarity vitiates much philosophical discussion of formal logic in its relation to Aristotle's logic. This is partly due to the tendency of some philosophers in the Hegelian or Marxist traditions, as well as those in the Neo-Thomist tradition, to ignore recent developments in the modern formal logic of propositions. They operate on the incorrect assumption that Aristotle's formulations are the last word in the matter.

Bertrand Russell, whose own philosophical work greatly contributed to the progress in symbolic logic in this century, has stated (1945, 202): "Throughout modern times, practically every advance in science, in logic, or in philosophy has had to be made in the teeth of the opposition from Aristotle's disciples." In connection with Aristotelian logic and its dogmatically adhered to formal interpretation, Russell (1945, 195) writes, "This makes it difficult to do historical justice to Aristotle. His present-day influence is so inimical to clear thinking that it is hard to remember how great an advance he made upon all his predecessors (including Plato), or how admirable his logical work would still seem if it had been a stage in a continual progress, instead of being (as it in fact was) a dead end, followed by over two thousand years of stagnation."

Confusion of two meanings of formal logic (continued)

The tendency of some philosophers to treat Aristotle's logic as the only formal system of logic and to ignore modern symbolic logical systems in the discussion of formal logic may pose a problem for the theory of trialectics. This is due to the fact that formal logic is presented by Ichazo in the Aristotelian manner, and he therefore may be interpreted as one of those philosophers who believes that no progress has been made in the formalized logic of propositions since Aristotle. This, of course, would be something that modern logicians would be quite displeased with. [1]

Ichaso focuses on metaphysical logic

However, I believe such an interpretation of Ichazo's position would be a mistake. For one, he is quite aware of recent developments in modern logic and has particularly stressed the importance of Russell and Whitehead's *Principia Mathematica* in the necessary development of mathematical logic. (Arica 1982, 158) Therefore, it does not seem likely that Ichazo believes no advance has been made in formal logic since Aristotle. Nor does he seem unduly prejudiced against modern formal logic, as many Hegelian and Marxist dialecticians are. Secondly, as already pointed out, Ichazo is treating formal logic in the Aristotelian manner since he is discussing logic in terms of the history of metaphysical reasoning.

It should also be noted that Ichazo does not view metaphysics as an endeavor which proceeds in an a priori fashion and is separate from the discoveries of science. For Ichazo, as for Whitehead, metaphysics and science share an intimate relationship, both receiving from each other and giving to each other. Metaphysics, conceived partly as the attempt to provide a coherent generalized picture of the world which science investigates, must then evolve along with the evolution of science.

If logic is then viewed in the metaphysical manner in which Aristotle and the Hegelian dialecticians have viewed it, then it too must evolve with the scientific and metaphysical world view it is designed to reflect.

Since Ichazo shares this outlook, his treatment of logic must range beyond the formalized axiomatic systems with which modern mathematical logicians deal. This being the case, he should not be interpreted as presenting the theory of trialectics as a formalized axiomatic system in the mathematical sense. Nor is he criticizing modern formalized systems of propositional logic when he criticizes "formal logic" metaphysically from the perspective of trialectics. Discussion of Aristotelian logic in the theory of trialectics is justified, since logic is not treated in a purely formal or mathematical sense, but in a metaphysical sense and from a historical perspective.

Formal Logic and Metaphysical Logic, Continued

Relationship of logic and metaphysics

At this point, the issue of the relationship between logic and metaphysics naturally arises. Although many philosophers over the centuries have discussed and criticized formal logic from a metaphysical perspective, since the "mathematical turn" within logical theory that occurred toward the end of the 19th century logic has become increasingly thought of as a discipline divorced from metaphysics or from making any statements about the world as such.

Logic has thus generally come to be thought of as a strictly formal affair. It is viewed as concerning itself with the laws of valid inference within arguments and with the syntactic relations between the statements of a given "language" of arbitrary abstract symbols without reference to any specific content.

This is not to say, however, that no contemporary analytic philosopher is concerned with how formal logic bears on certain issues in metaphysics or its role in the sciences. On the contrary, much important work has been done in these areas. Yet, in these matters logic itself is almost always understood in a strictly formal sense, and not metaphysically as Aristotle, Hegel, and Ichazo understand it. Nor is it usually considered in a historical and pragmatic manner, that is, as intertwined with the science and culture of its time, as John Dewey insisted it should be.

Dewey's View of Logic

Dewey's roots in Hegel

Deeply influenced by the biological sciences, Dewey emphasized that everything should be seen in terms of its connections to the organic realm and its origins in the natural condition. Nonetheless, his pragmatic naturalism retained some of the Hegelian notions he absorbed as a graduate student. Dewey's naturalistic Hegelianism is evident in his views on the nature of logic, since for him logic was not just the formal manipulation of static symbols according to rules and regulations. Of Dewey's relation to Hegel, John Passmore (1966, 172-173) writes, "The link between Dewey's 'instrumental logic' and the logic of Hegel will be obvious . . . . His criticism of formal logic contains few novelties for those who approach it through a study of Hegel and post-Hegelian Idealism."

In his book, *Logic: The Theory of Inquiry*, Dewey presents the most complete expression of his views on logic. There he presents the idea that logic must be conceived of not only as a progressive discipline which is subject to change in time — particularly as advances in science are made — but also as something which is intimately connected to and arising out of the biological and cultural matrix, not as something independent of it. [2]

Dewey's View of Logic, Continued

Dewey's roots in Hegel (continued)

Thus, in line with Hegelians and Ichazo, Dewey does not approach logic in an *ahistorical* manner and in a "merely formal" context. In the chapter entitled, "The Needed Reform of Logic," Dewey consequently discusses Aristotle's logic as it reflected the culture and science of its time.

Aristotle sought for essentials of subject

According to Dewey, the science of Aristotle's time sought for *the* definition of a subject, that is, for a subject's *essential*, fixed, or permanent attributes, rather than seeking, as modern science does, the most general principles exemplified in the nature of change. Aristotle's logic, then, provided the underlying conceptual structure, paradigm, or "metaphysical research programme" (to use Popper's term), for Greek science. Dewey (1938, 83-84) writes, "This logic was not formal in the sense in which forms are independent of existential subject-matter. It was formal but the forms were those of existence in so far as existence is known — *known* as distinct from being merely sensed, or discursively thought about, or an object of guess and opinion."

Here Dewey points out that Aristotle's logic reflects Aristotle's theory of knowledge, since for the Greeks true knowledge could only be had of the unchanging, *Being*, as opposed to the changing, or *Becoming*. Since the Greeks did not believe one could have real knowledge of that which changes, their science did not seek to discover the principles of change. The principles of Aristotelian logic, then, were not taken as merely formal and as Dewey (1938, 87) states, "They are not independent of 'subjects' known. On the contrary, they are the forms of these subjects as far as the latter are articulated in knowledge."

Aristotle's logic served as the "guiding principles" by which the science of his time could understand and define, and did so by the attempt at grasping the fixed essence of a subject as well as the attempt to classify subjects within their proper fixed class, i.e., genus and species.

Dewey's reform of logic

However, since science is different today than it was in Aristotle's day, Aristotle's logic can no longer serve science in the same way it once did. Dewey's plea for "the needed reform of logic" was for a reform which was not just a mathematical or formal one, but which was bound up with the science and culture of his time.

Dewey's View of Logic, Continued

Dewey's reform of logic (continued)

Dewey's (1938, 94) historicist approach to logic is seen clearly when he writes, "It would be completely erroneous to regard the foregoing as a criticism of the Aristotelian logic in its original formulation in connection with Greek culture. As a *historic* document it deserves the admiration it has received .... What has been said is a criticism of the effort to maintain that logic, with revisions here and additions there, as adequate or even relevant to the science of today. As has already been said, the more fixed and complete it was for the class-culture of the epoch in which it was formulated, the less adapted is it to present conditions and demands of knowledge. The attempt to retain Aristotelian logical forms after their existential foundations have been repudiated is the main source of existing confusion in logical theory. It is the ultimate reason why logical forms are treated as *merely* formal."

And in connection with logic and present day science and culture, Dewey (1938, 95) writes, "The Aristotelian logic as far as its spirit, instead of its letter, is concerned, is nevertheless both generically and specifically significant for what needs to be done in logic in the contemporary situation. Generically, the need is for logic to do for present science and culture what Aristotle did for the science and culture of his time."

Dewey's method of effective inquiry

Consequently, Dewey's own logical theory in its most general sense is the attempt to establish a *method* of effective inquiry for acquiring knowledge of the world. The new reconstruction of logic is therefore needed to "generalize the acknowledged methods of the natural sciences." (Nagel 1940, 60) In such a conception of logic, logical principles themselves would play the role of "guiding principles" in scientific inquiry.

Dewey's views on logic differ, however, from the views of the dialecticians and Ichazo since he did not believe that one should attempt to construct a *metaphysical* logic which would serve as the laws which govern all of reality. Dewey did not believe that it was possible to formulate such general laws of reality, given the dynamic nature of modern science. Whether Dewey's views on this matter are correct or not is certainly a matter of debate, but this debate will not take place in this paper.

Dewey and Ichazo do not discuss symbolic logic

Dewey's similarities with Ichazo will be seen to extend further when we consider that Dewey also did not discuss the mathematical advances in modern symbolic logic in his discussion of formal logic. Dewey, like Ichazo, restricted his discussion of formal logic to the three laws of Aristotle, which he called the "formal canons of relations and propositons." The relation between Dewey and modern logic has been discussed by David Sidorsky as follows:

"For the student of logical theory in the 20th century, Dewey's interest in logic presents an intriguing, seeming paradox. Despite his continuous interest and publication in this area, he did not anywhere discuss the major accomplishments in logic that occurred during his lifetime. There is no reference in Dewey's logical theory to the great works in both the technique and the theory of logic of such logicians as Frege, Whitehead, Russell, Hilbert, Carnap, Tarski, or Gödel.

Interest in most general form of thought

"The reasons for this puzzling fact are twofold. The first one, in my opinion, is that Dewey remained faithful to a more traditional conception of the relationship between logical theory and philosophy. In that conception, a philosopher's theory of logic was his most general formulation of the norms of thought and inquiry that governed successful intellectual activity, including his own philosophical activity. Thus Aristotle's or Hegel's logic is understood as formulating the rules of thought that had been exhibited in their philosophical work and that presumably could be found in nature or in history . . . . Dewey believed that he had participated in the development of an experimental and naturalistic philosophy. Accordingly, his logic would develop the pattern of experimental methods of inquiry in its most general form.

Interest in context

"The second reason for Dewey's lack of interest in the actual achievements in the field of logic in the 20th century is that they were set within a framework of mathematical logic or formal analysis of systems of logic. Dewey's concern was the relationship of methods of inquiry, whether formal or experimental, to their biological, social, or psychological context. For the practitioners of logic, then, Dewey could be described as a social psychologist of the theory of logic. For Dewey, in turn, the logicians were the technicians of a mathematical or linguistic symbolism, who were not sufficiently concerned with the context, conditions, or consequences of their methods and symbolic apparatus." (Sidorsky 1977, 23-24)

Similarity to Piaget

If we consider Ichazo, like Dewey, as a philosopher who maintains the traditional relation between logic and philosophy, and also as a "psychologist of the theory of logic" and not as a logician in the mathematical sense, then we can justify his neglect of modern symbolic logic and his concentration on the traditional Aristotelian logic.

Here we could also note the similarity between Dewey's and Ichazo's respective approaches to logic and that of the Swiss psychologist Jean Piaget. All three can be seen as psychologists of logic and all three view logic as arising out of the process of cognitive development. This process is intimately connected with the person's interaction with the world, and for Ichazo and Piaget, it is a process which unfolds in a sequentially pre-established and hierachically ordered manner. (See Piaget 1970, and Piaget and Inhelder 1964)

Falsification and metaphysical laws

Still, a major problem which arises for trialectics when the laws are stated as metaphysical propositions is that as descriptions of being as such, they appear to be unfalsifiable by empirical investigations, thus falling on the wrong side of the line of demarcation which Popper (1959) has drawn between science and pseudo-science. If the principles of trialectics are taken solely as metaphysical *descriptions* of being, then they are irrelevant to successful scientific inquiry.

Fortunately, this issue has been taken up in this volume by Hal Caswell (1983), who has stated the laws of trialectics in an *injunctive* form, rather than in a *descriptive* form. In this manner, the logical laws of trialectics become directive, and act as guiding or regulative principles in the context of scientific inquiry. Indeed, this is the manner in which Dewey believed logical laws should function. Like the Hegelians, Dewey did not believe that the laws of Aristotelian logic were ontologically valid due to their inadequacies with regard to temporality, but rather that "they are valid as directive principles, as regulative limiting ideals of inquiry."

Injunctive form of laws avoids falsification issue

If we consider the laws of trialectics, as well as the laws of dialectics and formal logic, in the injunctive form, then for each respective type of logic, inquiry will be directed in a certain way. This is consistent with Dewey's views on the role of logical laws within the context of scientific inquiry, since for him, an inquiry will reach its goal when it discovers those conditions which satisfy the directives of the logic which guides it.

Injunctive form of laws avoids falsification issue (continued)

The conditions to be discovered will therefore be different for each respective logic mentioned above, since each logic differs in its directives. Trialectics then finds an important role within the scientific enterprise itself, in addition to its more metaphysical role in forming the logical principles which generalize the discoveries of modern science. Trialectics can then be seen as an attempt to achieve what Dewey believed logic should achieve and what he himself attempted, although with a less metaphysical emphasis, namely, "to do for present science and culture what Aristotle did for the science and culture of his time."

Locating Modern Formal Logic in Ichazo's "Formal Logic"

Privileged status of the three laws

In addition to justifying Ichazo's consideration of formal logic in the Aristotelian sense on the grounds that his approach proceeds in a historical and metaphysical manner, justification may also be granted for independent philosophical reasons. These reasons come out of purely *formal* considerations of the nature of modern propositional logic. Therefore, I hope to show that although modern propositional logic has advanced beyond Aristotelian logic and that the "laws of thought" are no longer the only axioms of formal logic, and although the laws are not stated in the same way that they were stated by Aristotelian logicians, nonetheless, they do retain a certain privileged status in the propositional calculus.

The privileged status of the three laws of Aristotelian logic can be seen if they are considered in a *meta-theoretical* sense,that is, as principles that form the basis or foundation upon which all two-valued systems of propositional logic are based. In this sense, the "laws of thought" can be seen as necessary to the *construction* of any formal system of propositional logic though no viable formal system can be formulated with those principles as the *only* axioms. In fact, in this meta-theoretical sense, the principles need not appear at all within any propositional system as theorems or axioms of the system.

It should be noted that this may not be true if we consider certain "intuitionist" theories of logic and mathematics, or any other forms of n-valued or "deviant" logics in which the law of excluded middle or "bivalence" (i.e., that all propositions must be assigned a definite truth value, true or false, and no third indeterminate value is posited) is rejected. Yet, such mathematical issues are quite complex and controversial and since they do not bear directly on the basic propositional calculus in which the law of bivalence is operative, they are not germane to our discussion.

Privileged status of the three laws (continued)

Furthermore, I do not believe it is necessary to discuss the first order or higher order predicate calculus since, as Wittgenstein held, propositional logic is a more fundamental and basic form of logic which predicate logic builds upon. Hence, for Wittgenstein, all statements in the predicate calculus can be reduced to statements in the more basic propositional calculus. But even if Wittgenstein's view is rejected, since our discussion will focus on the nature of the initial assignment of truth-values to propositions in modern logic — a process which is the same in both propositional and predicate logic — a discussion of the more basic propositional logic will suffice.

Three laws stated in propositional logic

To make the relation between the three laws of thought and modern propositional logic clearer, we should first translate them into the appropriate symbolization. Therefore, following Copi's approach, we see that:

1. *The law of identity* (A = A), expresses the meaning in propositional logic that A implies itself (A→A), which is a tautology.
2. *The law of contradiction or negation (A ≠* B), expresses the same meaning as the tautology that it is not the case that, when B = -A, (A & -A) is true, i.e., (-(A & -A)) is true.
3. *The law of the excluded middle* (A ≠ A+B), is equivalent to the tautology that when B = -A, (A or -A) is true, i.e., (A v -A) is true.

Three laws fundamental to truth-tables

Copi (1961, 273) acknowledges the fact that "While the three 'Principles' are true, it may be doubted whether they have the privileged and fundamental status traditionally assigned to them." Copi then goes on to say, "Yet the three 'Laws of Thought' *can* be regarded as having a certain fundamental status in relation to truth tables." This is significant in justifying a critique of formal logic based on just these three principles, since all two-valued systems of propositional logic use the truth-table, whether explicitly or implicitly, as the means for deciding the logical validity of any statement within any given system. Therefore, these three laws, since they are fundamental to the formation of truth-tables, can then be seen to be fundamental to all two-valued systems of propositional logic. This can be made clearer by considering a truth-table:

A	B	A * B...
T	T	
T	F	
F	T	
F	F	

Three laws fundamental to truth-tables (continued)

where A and B are sentential letters representing propositions; A * B is a molecular proposition consisting of the atomic components A and B; * is any logical connective of this system; and T and F stand for the truth-values, true and false, respectively.

A proposition is any sentence expressing something true or false. For example, "Your daddy's rich" is a proposition which can be represented by the sentential letter "A". The proposition "Your momma's good lookin'" may be represented by the sentential letter "B". "Your daddy's rich and your momma's good lookin'" is then a *molecular* proposition "A & B", made up of the two *atomic* propositions "A" and "B", respectively.

The purpose of the truth-table is to determine the truth or falsity of any given proposition by considering all the possible combinations of truth-values of its atomic parts, and their relation to the particular logical connective (*) governing the proposition. In other words, the truth-table is simply a *method* for determining whether a sentence is true or false. For example, consider the case where * is the logical connective &, "and." Then, the statement "A & B" is true only in the case in which both atomic parts are true, i.e., A is true and B is true. This is illustrated by the truth-table for "A & B":

A	B	A & B
T	T	T
T	F	F
F	T	F
F	F	F

which expresses in an explicit, diagrammatic way the logical meaning of the expression under consideration. [3]

Three laws govern the assignment of truth-values

The important point to be made for the three Aristotelian principles in regard to the truth-table is that they implicitly govern the way in which we assign truth-values to the sentential letters in the initial columns of the table. As Copi (1961, 273) explains, "As we fill in subsequent columns by referring back to the initial columns, we are guided by the 'Principle of Identity': if a T has been placed under a symbol in a certain row, then in filling in other columns under expressions containing that symbol, when we come to that row we consider that symbol still to be assigned a T. In filling out the initial columns, in each row we put either a T or an F, being guided by the 'Principle of Excluded Middle'; and nowhere do we put both a T and F together, being guided by the 'Principle of Contradiction.' The three 'Laws of Thought' *can* be regarded as the basic principles governing the construction of truth-tables."

Three laws govern truth-value assignment in any two-valued logic

Given this conclusion we may go even further and state that, in general, and without recourse to reliance on the truth-table method, these three principles will guide the assignment of truth-values to any single sentential letter or atomic proposition within any two-valued system of logic, simply in virtue of there being only two values to which to assign any single sentential letter.

To see this we must consider the way in which truth-values are assigned to sentential letters within the meta-theory of propositional logic. This is usually done in terms of the notion of an "interpretation" of a given system of propositional logic, which is "mostly just an abstract account of what is explained by means of the usual truth-tables." (Hunter 1971) Thus, when P is any propositional system, an *interpretation* of P is an assignment to each sentential letter of P of one or the other (but not both) of the truth values truth and falsity." To see what is involved in this notion, let I be any interpretation of P, and A and B sentential letters representing propositions of P. Then:

(i) If A is a sentential letter, then A is true for I if and only if I assigns the truth-value truth to A. (i.e., v(A) = T, where "v" stands for "truth-value.")

(ii) -A is true for I if and only if A is false for I. (i.e., v(-A) = T if and only if v(A) = F.)

Three laws govern truth-value assignment in any two-valued logic (continued)

From these definitions of "true for an interpretation of P," the following implicit guidelines to the assignment of truth-values to sentential letters are seen to be operative:

1. We assign v(A) = T or v(A) = F. (Excluded middle)
2. We do not assign v(A) = T and v(-A) = T. (Contradiction)
3. The value assigned to A is unalterable for that given interpretation, I. That is, if v(A) = T for I, v(A) is true in all subsequent discussion of A under I; and it is not the case that v(-A) is true in all subsequent discussion under I. (Identity)

Although this last guideline is not a direct consequence of the definition of "true for an interpretation," it is an obvious and necessary rule which must be operative to insure against logical chaos in the propositional calculus.

Summary and conclusions

Having shown that the three laws of Aristotelian logic are necessary, fundamental, meta-theoretical principles in all two-valued systems of formal logic, we are justified in restricting our general discussion of formal logic to these three laws. This justification is warranted as long as our discussion is from a meta-theoretical perspective on the laws of formal logic. This is the case in both Dewey's and Ichazo's respective treatments of formal logic since their discussions do not concern matters *within* the formalized systems themselves.

Insofar as these three laws are represented as serving as a guide or as principles for how reality is to be conceived, they can be criticized in the metaphysical sense in which Hegel, Dewey, and Ichazo have done. And, insofar as modern formal or symbolic logic is not advanced as explanatory of the processes of reality, there is no need to make mathematical logic the subject of criticism.

The crux of the matter is that when a philosopher wishes to establish the logical laws whereby we can best understand reality — a desire of philosophers from Aristotle to Hegel — the laws of formal logic will not do the entire job. They will only be applicable to the realm of space. Different logical laws are necessary for time and cyclic processes, respectively. According to Oscar Ichazo, these additional logics are: dialectics for time, and trialectics for cycles.

Since the situation in contemporary academic philosophy is now one in which a pragmatic metaphysics may be greeted openly, trialectics may be seen as a timely development.

Notes

[1] Acknowledgments

This point has been forcefully made by Wyatt Woodsmall in the discussion at the First Lexington Conference. I am indebted to Woodsmall for bringing to my attention certain issues in the relation between trialectics and formal logic which needed to be clarified. I also owe the references to Russell to Woodsmall.

[2] Dewey's relation to dialectics

In addition to Dewey's relation to Hegel, comparisons with other dialecticians can be found in Jim Cork, "John Dewey and Karl Marx," in Sidney Hook (Ed.), *John Dewey: Philosopher of Science and Freedom* (New York: Dial Press, 1950).

Also, for an interesting exchange between Dewey and Ernest Nagel on the issue "Can Logic Be Divorced from Ontology?", see Sidney Morgenbesser (Ed.), *John Dewey and His Critics* (New York: The Journal of Philosophy, 1977).

[3] Truth-tables

For a more detailed account of the truth-table method in logic, see chapter 8 in Copi (1961) as well as almost any introductory text in formal logic, e.g., Benson Mates, *Elementary Logic* (New York: Oxford University Press, 1972) and Richard Jeffrey, *Formal Logic: Its Scope and Limits* (New York: McGraw-Hill, 1981).

For what is usually agreed to be the origin of truth-tables, see Ludwig Wittgenstein, *Tractatus Logico-Philosophicus*, trans. by Pears and McGuiness (London: Routledge & Kegan Paul, 1961), originally published in German in 1921. In addition, for a separate though simultaneous discovery of truth-tables, see Emil Post, Doctoral Dissertation, Columbia University, 1920, published under the title, "Introduction to a General Theory of Elementary Propositions" in *American Journal of Mathematics*, vol. 43 (1921), 163-185.

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Chapter 7
Trialectics, Cybernetics, and Zadeh's Theory of State

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Introduction

Trialectic logic

"Trialectic logic" has been proposed by Oscar Ichazo (1976,1982) as a metaphysical framework within which it is possible to apprehend the unity underlying the diverse and continually changing processes of the natural world. As presented by Ichazo, trialectics is an ambitious construction; he places it in a sequence following "formal logic" and "dialectical logic" as one of the major philosophical frameworks which have appeared in the history of human thought.

Scope of paper

The scope of the present paper is much less broad. I intend to examine trialectics as an approach to the scientific problem of understanding the dynamics of complex systems and to compare it to recent developments in system theory and cybernetics. It turns out that they are convergent approaches to understanding dynamics, and that the principles of cybernetics shed some valuable light on trialectics.

The existence of such convergence is not surprising. Ichazo (1982) points out that major metaphysical systems are not invented by any one individual, but are codified after they have arisen, out of necessity, in the development of human thought. Cybernetics and system theory developed as conceptual tools to deal with change, interaction, and cycles: the very problems addressed by trialectics.

For more complete discussions of trialectics, see Ichazo (1976, 1982) or Horn's (1983) contribution to this volume.

Formal logic and dynamics

In the context of dynamics, the formal logical approach is characteristic of pre-Galilean dynamics, with its emphasis on identity as explanatory principle.

Formal logic and dynamics (continued)

"The earliest Greek thinkers had imagined that the motion of every object was controlled by a tendency, inherent in the object, to find its 'natural place' in the world. A stone sank in water because the natural place for stones was the bottom of a stream; flames ascended in air because their natural place was up in the sky and so on. Aristotle explained this by the supposition that bodies possessed varying degrees of heaviness and lightness, and that the natural arrangement of the world was in order of heaviness, the heavier bodies taking their places below and the lighter above —like layers of oil and water." (Jeans 1943, 105)

Dialectics and dynamics

The dialectical approach to dynamics invokes contradiction, conflict, or struggle as the source of change.

"According to dialectical materialists, developmental processes are not merely the result of systems interacting with forces or other systems outside of themselves, but are directed, to a large extent, by processes, the so-called contradictions, or contradictory tendencies, within each system itself . . . . Taking into account internal properties, especially their contradictions, is the key notion of the dialectical materialist view of change that most sharply distinguishes it from the mechanist materialist view." (Allen 1980)

Trialectic descriptions of dynamics

Among the most prominent differences between dialectics and trialectics are the latter's emphasis on attraction instead of contradiction or struggle in the explanation of dynamics, and on the importance of cycles, which replaces the notion of continuous transformation of quantity into qualitative change.

A procedure for describing dynamic processes is outlined in the first axiom of trialectics (the axiom of mutation). According to this axiom, any process can be described in terms of:

- an *attractive* element
- an *active* element, which is susceptible to the attraction of the attractive element
- a *function*, which relates the active and attractive, and is internal to and unchanged by the process, and
- a *result*, which is produced by the function.

Example: predator-prey

For example, in the interaction between a deer and a tiger, it is said that the deer is attractive, the tiger is active, hunting is the function, and a dead deer and a satisfied tiger the result.

A critique of this example

This example of trialectic analysis is far too superficial a description of the deer-tiger interaction to be useful to a biologist interested in tigers or deer or the feeding behavior of feline predators or predator-prey interactions in general.

In the first place, it is specific to a single instance of behavior. It tells us nothing about whether tigers will always attack deer when they see them (they don't), nor about what the tiger will do if it sees a rabbit or a water buffalo instead of a deer. And yet the function "hunting," as something internal and invariant to the process, *should* reveal something about these aspects.

Not only is the description limited in generality, it is not sufficiently detailed, for it tells nothing about the way in which the behavior of the animals unfolds through time. Only an end result is presented; someone seriously interested in this process would want to know something about dynamics.

Nor is it clear how the scene which includes the tiger pursuing the deer through the jungle was identified as "a tiger pursuing a deer." It has this identity only if we choose to see it that way; it might equally well "be" a deer fleeing from a tiger (escape is attractive, the deer is active, a complicated set of hormonal and muscular interactions the function, and a dead deer the result), or other possibilities still farther removed from the original (e.g., an interaction of animals — the deer *and* the tiger — with the plants surrounding them).

More detailed analysis possible

In one passage, Ichazo indicates the possibility of a more detailed level of trialectic analysis, again in the context of feeding behavior:

"This principle of action-attraction can be better understood with the following example: when we become hungry, the attractive is manifested, and gives us the impulse to intake food which becomes the active point that fulfills hunger. The hungry body takes the active of the food and becomes transformed in time to active by the satisfaction. The satisfied body that now is going to feel the need of outside work now is attractive for him and will proceed in this way until he gets tired and the cycle is repeated again. There is no contradiction between appetite and food. In this way we understand the active-attractive principle upon which the law of circulation is based. In trialectics, the circulation will always occur because it is based on the principle of one thing linking to another, and then, in turn, becoming the other." (Ichazo 1976, 82-84)

More detailed analysis possible (continued)

As this passage suggests, in a more detailed, dynamic level of trialectic analysis the interaction between the tiger and the deer will be described by the unfolding of a process which is set in motion at some point and continues through time.

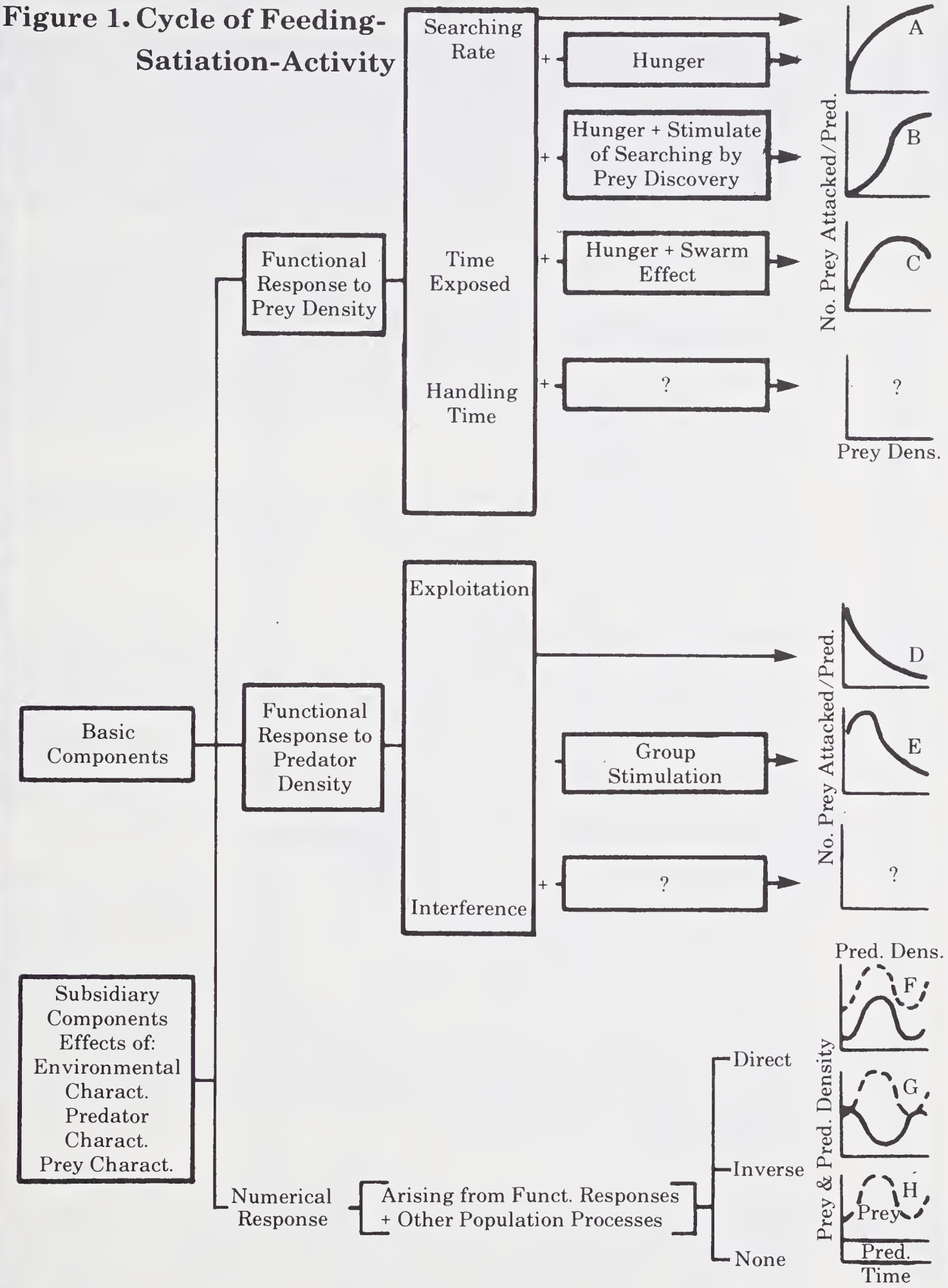
Detailed predator-prey models

Over the last thirty years ecologists have taken just such an approach to the analysis of predator-prey interactions. To get an idea of the complexities involved in the cycle of feeding-satiation-activity-feeding outlined above, consider Figure 1. It shows some of the factors which determine the feeding behavior of predators, including prey density, learning, alternate types of food, the spatial pattern of the prey, non-random searching by the predators, interactions between predators which encounter each other in the process of search, and the effects of feeding on predator growth, prey mortality, and the joint stability of the predator and prey populations.

There is a large and growing literature of experimental and mathematical analyses of these factors (e.g., Hassel 1978), which form the basis of strategies for the ecological control of pests, the management of fisheries, and the control of infectious diseases and parasites.

Our present understanding of predator-prey interactions, based on the concepts of system theory, goes far beyond the simple trialectic analysis of the tiger-deer interaction. Still, there is enough similarity of approach to suggest that a refinement of trialectics might lead in the same direction. Before deciding, we need to consider system theory in some detail.

Figure 1. Cycle of Feeding-Satiation-Activity



Cybernetics

Early history of dynamics

Although they differ slightly in their emphases, I shall not distinguish here between *cybernetics*, *general systems theory*, and *systems analysis*. All are concerned with the study of systems (i.e., collections of entities interacting to produce a whole which is worthy of study above and beyond its constituent parts), and with process (the dynamics or development through time of systems).

Science has, of course, been concerned with dynamics for a very long time. The earliest foci of this interest seem to have been astronomy (the dynamics of the heavenly bodies), mechanics (the dynamics of physical objects) and cosmology (the dynamics of the universe, of the geological development of the earth, of the evolutionary development of life, and of the historical development of human civilization).

In each case there has been a development from a mythological to a scientific approach to the problem, and the dynamic viewpoint is now fundamental to every branch of science.

Newton's dynamics

The work of Isaac Newton in the 17th century set the stage for the modern approach to dynamics. Newton was the first to succeed in bringing the dynamics of heavenly bodies and earthly objects into a single unified framework. Much of his contribution was the development of a mathematical approach (the calculus) capable of expressing dynamic laws. We will see later in this paper in precisely what sense that invention was fundamentally necessary.

Although Newtonian physics was a great triumph, in practice it was limited in the sorts of phenomena with which it could cope. It worked best on simple linear chains of causation (one billiard ball hits a second, which hits a third — —). Problems involving even moderate numbers of interacting components tended to be intractable unless the interactions among them were so weak (e.g., intermolecular interactions in a gas) or so monotonous (e.g., atomic interactions in a crystal) as to permit the components to be treated statistically.

Governors in steam engines

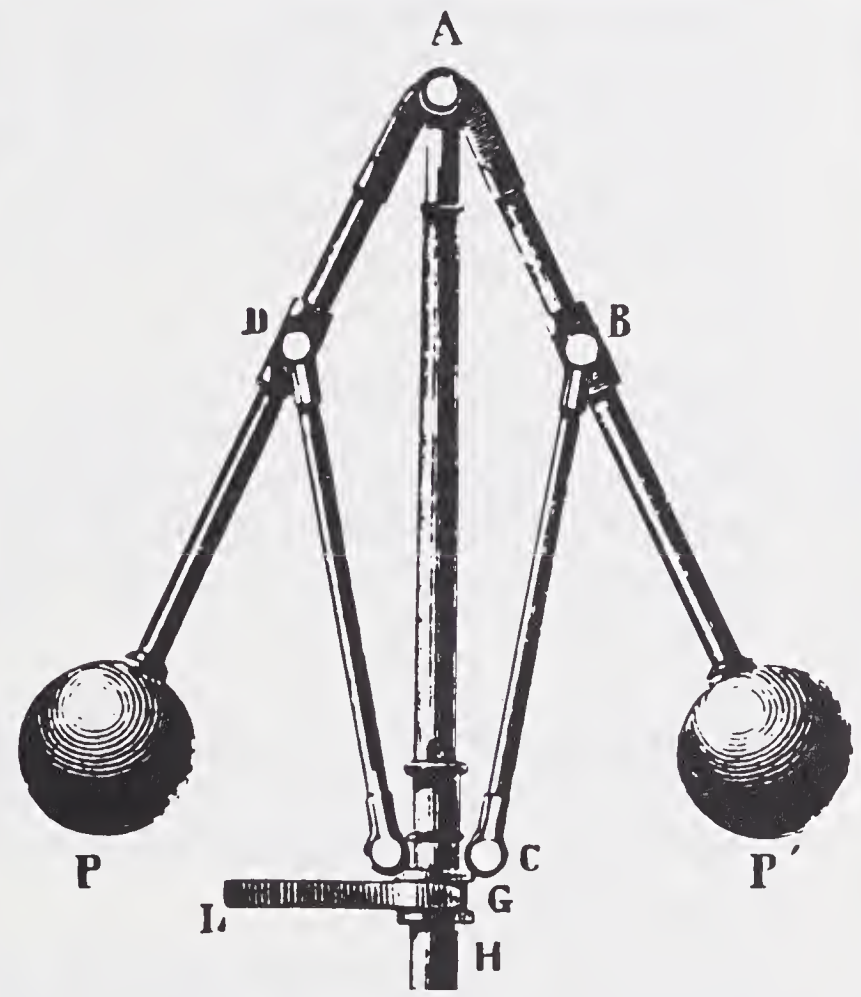
By the middle of the 18th century, technological developments had greatly increased the mechanical power available to society, and the need to understand more complex systems of causation arose out of the problem of controlling that power (Mayr 1970, Bennett 1979). One important step was the development of "governors": devices intended to keep a steam engine operating at a constant speed even in the face of a varying load. James Watt had designed one such device, shown in Figure 2.

Governors in steam engines (continued)

A pair of metal weights attached to the shaft of the motor swing outward due to centrifugal force when the motor speeds up and collapse inward due to gravity when it slows down. By connecting these weights to a valve controlling the flow of steam, it is possible to speed the engine up when it begins to slow down and to decrease its speed when it begins to speed up.

Illustration of a governor

Figure 2. The Governor



From HISTORY OF CONTROL ENGINEERING 1800-1930 by S. Bennett. Copyright © 1979 by The Institution of Electrical Engineers. Reprinted with permission of the publisher.

Behavior of governors

Engineers discovered through experience that such systems possessed several possible modes of behavior, depending on the details of their construction (Figure 3 a,b). In some cases, the engine would converge, smoothly and more or less rapidly, to a constant speed and return there if something perturbed that speed (e.g., adding a load to the engine).

Other configurations, however, exhibited decaying oscillations, the velocity converging to an equilibrium by a series of overshoots and undershoots. Sometimes persistent cycles could be observed, in which the velocity oscillated around its desired value but never converged to it. In still other cases, the system could exhibit diverging oscillations, the amplitude of which increased until the system destroyed itself. (I shall suggest later that, in a suitably general sense, these discrete modes of behavior are examples of what Ichazo (1976, 1982) calls material manifestation points, or MMPs).

Maxwell's mathematics for governors

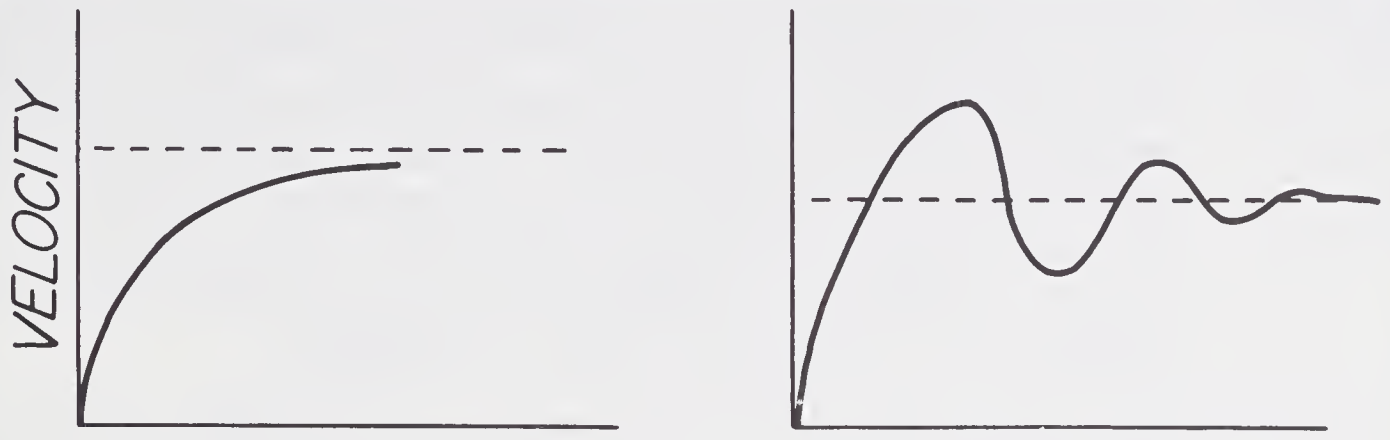
The first of these modes of behavior is what the designers had in mind. The second might be acceptable, but the last two clearly are not. It was not until 1868 that James Clerk Maxwell succeeded in working out the mathematical criteria which separate these four cases, in a paper which became one of the roots of modern cybernetics.

Causation is circular

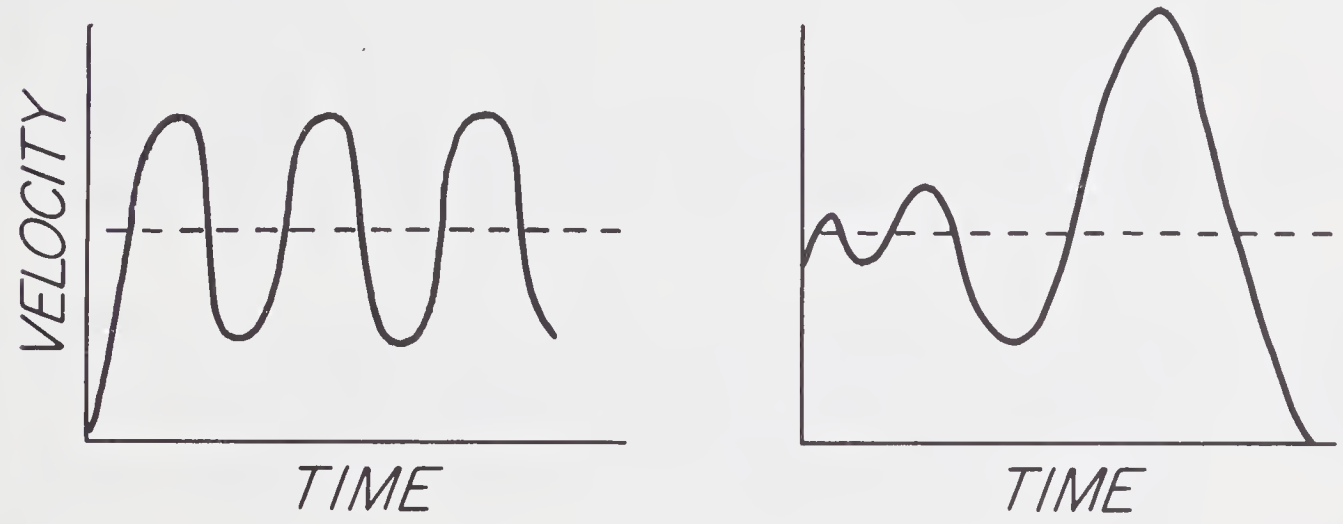
While the mathematics is not important for us here, we do need to ask the reason why the problem was so difficult in the first place. The clue is in the diagram showing the flow of causation in the system (Figure 3c).

The speed of rotation is determined by the steam input to the engine, and in turn determines the angle of the metal weights on the governor. But this angle in its turn determines the flow of steam to the engine. Causation in this system is circular; there is no simple Newtonian cause and effect of the sort that happens when one billiard ball strikes another. Such cycles of causation are an important connection between cybernetics and trialectics, which has been described as a "logic of cycles."

Figure 3. Possible Modes of Behavior of a Governor



3a



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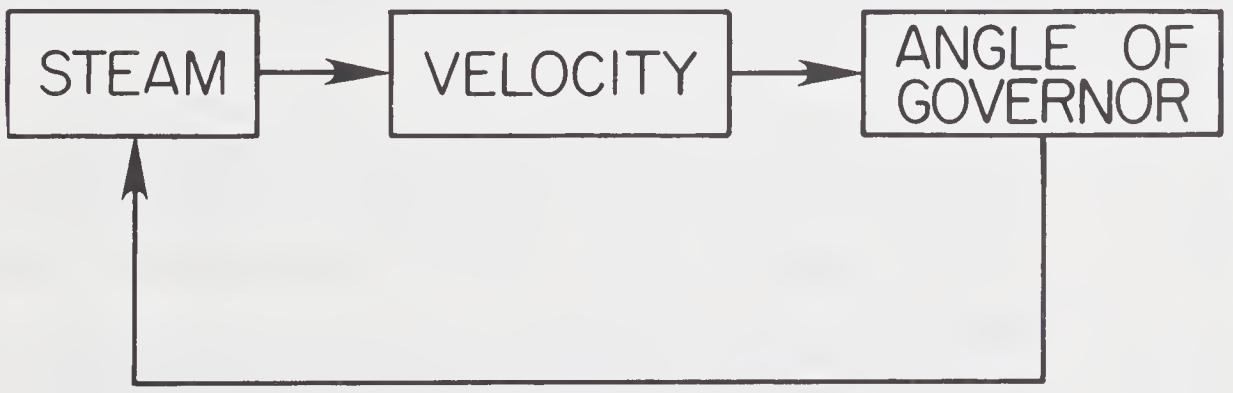


3c

Feedback in cybernetic systems

In the early 20th century, engineers became adept at analyzing certain sorts of circular causal systems (Bennett 1979), particularly as they developed workable radio systems. (The howl of "feedback" in an amplifier is a circular causal system gone berserk.) During and immediately after World War II, a group of scientists realized that such systems exhibited important purely formal properties —properties, that is, of the pattern of interaction among the components regardless of whether those components were electrical, mechanical, neurological, social, or biological.

For example, the steam engine governor is formally identical to the thermostat system regulating the temperature in your house and the neurophysiological system regulating your blood pressure, although the material details of the three systems are totally different. The study of these general properties was called "general systems theory" or "cybernetics" (from the Greek for "steersman"). Among the most important figures in the development of these fields were Norbert Wiener (1948; also see Heims 1980), Gregory Bateson (1972, see Lipset 1980), Warren McCulloch (1965), W. Ross Ashby (1954, 1956), and Ludwig von Bertalanffy (1968).

Main ideas of cybernetics

The history of cybernetics deserves a thorough investigation as a social and a scientific phenomenon but here I will merely list some of the most important concepts that it introduced into scientific discourse. Each of these concepts connects with one or more aspects of Ichazo's presentation of trialectics. The last of them, the concept of the *state* of a system, I shall pursue in detail, since it sheds some light on the actual process of trialectic analysis. The ideas I shall mention are (1) goal directed behavior, (2) self-reference, (3) energy and information, (4) wholeness and interaction, and (5) theory of state.

Goal directed behavior

Among the several kinds of causation admitted by the Aristotelian view of things was the "final cause," considered to be responsible for the orderly achievement of a preconceived ultimate goal.

The Newtonian viewpoint was much more mechanistic; systems were driven not only by their ultimate goals but by their initial conditions. Particularly in the hands of Laplace, Newtonian physics denied any place for teleology in the explanation of behavior. Since goal directed behavior is such an obvious property of living systems, this restriction is distinctly uncomfortable. Even physicists attempted to escape it by searching for "least action" principles.

Goal directed behavior (continued)

For example, the optical laws governing the angle of reflection of a beam of light off a mirror are such that the light beam minimizes the distance it travels. It is *as if* the beam of light has the goal of achieving the shortest possible path and chooses its angle of reflection accordingly. The search for such minimum (or maximum) principles remains an important aspect of dynamics but they are not sufficient to account for the examples of homeostasis and regulation so common in living systems.

Rosenbluth et al. (1943), however, pointed out that systems containing circular causal loops could and did exhibit purposeful behavior, provided only that the causal loops were properly organized. An understanding of the steam engine governor must take into account the desired speed of the engine. Cybernetics, in essence, opened the way for valid explanations phrased in terms of attraction to some final state.

Self-reference

In the simple feedback loop of the governor, the velocity of the engine is determined by the steam, the steam is controlled by the governor, and the governor is controlled by the velocity.

It is only possible to single out any one of these variables as "cause" and another as "effect" by recognizing the seed of the opposite within each. This is a form of self-reference and self-reference leads to fascinating logical problems (e.g., Spencer-Brown 1972, Hofstadter 1979).

In fact, the oscillations exhibited by some negative feedback systems (Figure 3 a,b) are equivalent to the logical oscillations generated by the statement, "This statement is false." Which, if it is false, must be true, implying that it is false, and hence true, and thus false, true, false, true. . . Since consciousness is defined as "that which recognizes itself" (Ichazo 1976), the appearance of self-reference in the description of dynamics, even of physical systems, is an event of considerable significance.

Energy and information

The pre-cybernetic paradigm for dynamics focused on energy and its transformation into work of different sorts. The early cyberneticians, however, introduced a clear distinction between *energy* and *information*, and pointed out that much of the behavior of cybernetic systems could best be understood in terms of information (Ashby 1970).

Energy and information: furnace and thermostat

Consider the thermostat controlling your furnace. It contains a small metallic coil which expands and contracts as the temperature changes, turning the furnace off and on. Most of the behavior of the furnace/house/thermostat system is determined by the thermostat (if you want to change that behavior, you head directly for the thermostat), but only a miniscule fraction of the heat energy produced by the furnace is absorbed by the metallic coil.

Although heat energy is involved, the thermostat is responding not to the energy but to information, specifically the difference between the room temperature and the set point of the thermostat. The thermostat is trivial from the point of view of energy processing, but crucial from the point of view of information.

The realization that information can influence dynamics was another major blow to the Newtonian view that behavior results from pushing rather than attraction. One of Gregory Bateson's favorite examples shows this even more clearly. If I kick a stone, I impart a certain energy to it and it moves in a manner determined by that energy. If I kick a dog (a much more cybernetic system), I also impart some energy, but the resulting movement of the dog is determined not by that energy, but by the information transmitted by the kick. That information ("Uh-oh, I'm in trouble") makes it attractive for the dog to leave, and he moves away from me by utilizing his own energy.

Wholeness and interaction

Since cybernetics attaches great importance to the causal pathways in a system, both those that transmit energy and those that transmit information, it naturally follows that it recognizes the importance of "whole systems." Any consideration of a partial system (and in practice one must always deal with partial systems) does some violence to reality by breaking causal loops which link that partial system to everything else.

Cybernetics is thus an approach to dynamics which leads to an appreciation and an understanding of unity. Since cybernetics takes a view of unity based on mutual (in particular, cyclic) interaction among all the components of a system, it has a fundamentally ecological outlook on the world.

Wholeness and interaction: Sufi story

"'What is Fate?' Nasrudin was asked by a scholar.

'An endless succession of intertwined events, each influencing the other.'

'That is hardly a satisfactory answer; I believe in cause and effect.'

'Very well,' said the Mulla, 'look at that.' He pointed to a procession passing in the street. 'That man is being taken to be hanged. Is that because someone gave him a silver piece and enabled him to buy the knife with which he committed the murder; or because someone saw him do it; or because nobody stopped him?'"(Shah 1972)

Formal theory of "state"

An important but not well-known contribution of cybernetics was to formalize the idea of the "state of a system" and the approach to modeling ("state space analysis") which is implied by this idea. I intend to spend the rest of this paper discussing state theory in some detail.

The discussion inevitably hinges on some subtle mathematical distinctions; I will try to make these clear with a minimum of formality. More detailed treatments are available in Zadeh (1964, 1969), Zadeh and Desoer (1963) and Caswell et al. (1972), the latter paper an elementary approach oriented toward biologists.

The Theory of State

Scientific description of dynamics

Our discussion of the theory of state begins with a goal: to describe the dynamics of a system. In particular, I assume that we are interested in a *scientific* description of these dynamics. The crux of this distinction is that we will not be satisfied with a description of any single specific instance of behavior, such as could be obtained by filming a single apple falling from a tree.

Scientific description of dynamics (continued)

We want a description that will help us understand the fall of apples generally, or even the fall of any object from any height, or maybe even the movement of objects in any circumstance whatsoever. This means that our description will be in large part a *prediction* about dynamics which we have not yet observed and thus will be falsifiable by empirical experience. This falsifiability is the hallmark of scientific theories in general.

Four steps of description

System theory breaks down the process of describing behavior into four steps:

1. Defining the system of interest and decomposing it into a set of component objects.
2. Describing the behavior of each of the objects.
3. Describing the interactions among the objects.
4. Combining the results of steps 2 and 3 to obtain a description of the entire system.

1st step: subjective

The first step must be recognized to be a subjective one, taken for the convenience of the observer in the context of his particular problem. Reality has no systems and no components, but for particular applications we may be able to get away with treating it as if it does.

2nd step: definitions

Assuming that we have defined a set of objects, we will focus now on the second step, that of describing the behavior of one of the objects within the system. For this task we define the following sequence of terms:

- A *behavioral feature* is any measurable property of the object (e.g., the metabolic rate of the tiger, the signals arriving at the tiger's optic nerves, its location, its speed, its posture, etc.). The behavioral features will be denoted by the symbol b, and later by e and r. The behavioral features must include all the relevant pathways by which the object interacts with the rest of its system.
- An *act* is an instantaneous value of the set of behavioral features, denoted by $b(t)$, $e(t)$, or $r(t)$.

2nd step: definitions (continued)

- A *behavior* is a time-series of acts. For example, a time series from some time t_0 to time t_1 would be denoted $b(t_0,t_1)$, $e(t_0,t_1)$, or $r(t_0,t_1)$. The distinction between acts and behaviors is crucially important. If you think of a behavior as a strip of movie film, an act is a single frame from that film.
- An *object* is a set of behaviors:

$$O = \{ b(t_0,t_1) \}$$

This makes clear the extent to which system theory is a science of process. An "object" in this theory is equated with the set of behaviors that it is capable of exhibiting.

Definition: model of a system

The goal of a dynamic study is to specify the set O, that is, to specify the set of behaviors which the object actually exhibits. There is a much larger set of behaviors, consisting of *all* the time-series that can be constructed from sequences of the behavioral features $b(t)$.

This set includes many, many behaviors that are never realized (apples spontaneously leaping from the ground to reattach themselves to the tree, etc.). The set O contains only the infinitesimal subset of these behaviors actually allowed by the laws of our universe, although this subset contains far more behaviors than we have observed or ever will observe.

When a systems theorist speaks of a "model of the such-and-such system," he or she is referring to a specification of the set O. Such specifications are, of course, always subject to revision as further information about the laws of behavior is accumulated.

Constructing a model

The definition of an object as a set of behaviors

$$O = \{ b(t_0,t_1) \}$$

suggests that the model might be constructed by direct enumeration of all the behaviors exhibited by the object. Practically, this is impossible, since the set O is usually infinite.

Stimulus and response variables

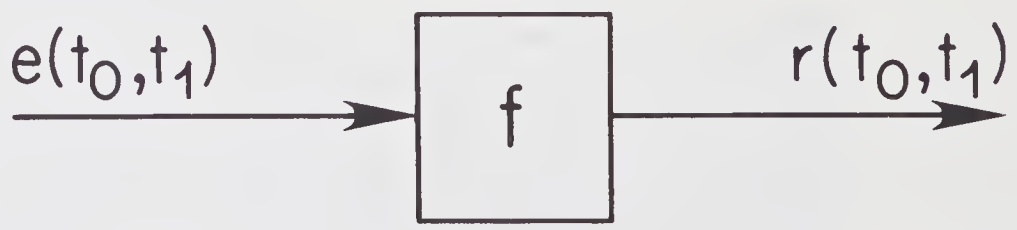
The approach which scientists have taken involves assigning an "orientation" to the set of behavioral features, dividing them into a set of *excitation* or *stimulus* variables *(e)* and a set of *response* variables *(r)*. This orientation also defines stimulus and response acts, $e(t)$ and $r(t)$, and stimulus and response behaviors, consisting of time series of these acts, $e(t_0,t_1)$ and $r(t_0,t_1)$. The model of the object can now be rewritten as a set of pairs of excitation and response behaviors

$$O = \left\{ e(t_0,t_1), r(t_0,t_1) \right\}.$$

The idea behind orientation of the object is that, in some sense, the response behavior $r(t_0,t_1)$ is elicited, or caused, by the excitation behavior $e(t_0,t_1)$. A scientist might then hope to generate the set O as a relation

$$r(t_0,t_1) = f(e(t_0,t_1)),$$

which could be diagramed



Lawfulness of function

Scientists have a strong belief in the lawfulness of nature. Accordingly, they require that the relation $f(\ )$ be a function — that is, that a complete time series of the excitation features *uniquely* determine a complete time series of the response features.

If, in any given attempt, a model fails to exhibit this degree of lawfulness, the modeler concludes that his function $f(\ )$ is incorrect or that he has accidentally ignored some variables which are actually operating in the system. (I will not consider here the problem of stochastic systems, in which the response exhibits a random component. Such systems, e.g., in modern physics, lead to serious philosophical problems of interpretation. Suffice it to say that there are corresponding conditions for the lawfulness of statistical predictions.)

Function relates time series

At this point we need to focus on what may appear to be a mathematical fine point, but is in fact crucial to the process of model construction. The function $f(\ )$ is not an ordinary function, mapping one numerical value into another. Instead, it relates *time-series* of responses to *time-series* of stimuli. This is a serious problem, because it is not at all easy to construct mathematical relations between time series.

The search for a function which relates acts

But since the movies represented by $e(t_0,t_1)$ and $r(t_0,t_1)$ are unrolling at the same rate, a logical escape from the problem of time series is to attempt to write response *acts* as a function of stimulus *acts*:

$$r(t) = g(e(t)).$$

This expression depicts the response of the object as elicited, *instant by instant*, by the sequence of instantaneous excitations. The function $g(\ )$ relates single numbers, not time series, and hence would be easier to construct.

Problem: indeterminacy

Unfortunately, this approach fails for all but the simplest of objects. The problem is indeterminacy: for most objects, the same instantaneous stimulus presented at different times may elicit different responses. What we need is an approach to modeling which avoids the difficulties of dealing with entire time series, but which can also produce determinate behavior descriptions.

Example of indeterminacy: Sufi story

"One day the Mulla was taking a donkey-load of salt to market, and drove the ass through a stream. The salt was dissolved. The Mulla was angry at the loss of his load.

Next time he passed that way he had a load of wool. After the animal had passed through the stream, the wool was thoroughly soaked, and very heavy. The donkey staggered under the soggy load.

'Ha!' shouted the Mulla, 'you thought you would get off lightly *every* time you went through water, didn't you?"(Shah 1972)

Example of indeterminacy: feeding behavior

A simple thought experiment, placing yourself in the position of a feeding predator, will reveal the source of this indeterminacy. Visualize if you will an unattractive piece of food, say a stale cheeseburger, perhaps a day or two old, a little dried out but not moldy. It is presented to you as a stimulus; your response is disdain.

Now change the conditions, and imagine that you have been hiking in the mountains, and all your food has been stolen by a bear. You have no choice but to hike two days to the nearest road, sustained only by a candy bar in your pocket and a few berries found along the way.

Example of indeterminacy: feeding behavior (continued)

When you arrive at the nearest road, faint with hunger, you see a large motor home disappear around the curve in a cloud of dust. As it disappears, out the window flies a crumpled paper bag bearing the familiar golden arches. You run over and find that it contains that very same cheeseburger. I daresay your response might be very different.

The importance of history

The same instantaneous stimulus has evoked two different responses. The explanation lies in the recent history of you, the object, in the two hypothetical situations. To remove the indeterminacy, we must incorporate information on this history into the behavioral description. A procedure for doing so was formalized by Zadeh in the 1960's (Zadeh and Desoer 1963, Zadeh 1964, 1969).

How much history for a model

To the extent that the indeterminacy of the instantaneous stimulus-response relation reflects the differing past stimulus history of the objects, it can be cured by incorporating information about the past into the model.

But how much information? Incorporating the entire stimulus history, $e(t_0,t_1)$, is guaranteed to work, but gains us nothing, since we are back to dealing with time series again. Moreover, it is not necessary. Your response as a hypothetical hungry hiker is affected by the food available over the previous 24 hours, perhaps even the past few days, but probably not by what you ate for Thanksgiving several years previously.

So there is some *relevant* portion of the stimulus history of the object which will just suffice to render the instantaneous stimulus-response relation determinate. We create a new variable, the *state variable, X(t),* to describe this relevant portion of the stimulus history. We can then obtain a determinate relationship between the instantaneous response and the instantaneous stimulus and state:

$$r(t) = G(X(t),e(t)).$$

How does one identify state variables?

How exactly do we construct this new variable and the new function *G( )* into which it enters? Good question, but one without easy answers. Zadeh provides a formal analysis, the essence of which is that the state variable provides an index for a division of the set of all stimulus behaviors into a set of equivalence classes based on determinism of present response. He presents a set of axioms that these equivalence classes must follow, but they provide little practical guidance in the actual identification of state variables.

Clues from animal behavior

Some clues can be found in ethology. Students of animal behavior had confronted the problem of indeterminacy earlier and had developed a similar solution. Where Zadeh speaks of a state variable, they refer to "intervening variable," "motivation," or "internal factors."

"It is a common observation that the same stimulus given to the same animal at different times does not always evoke the same response. Something inside the animal must have changed and we invoke an 'intervening variable.' This is something which comes between two things we can measure — in this case the stimulus we give and the response we get out — and affects the relationship between them. We must admit that in some cases we know next to nothing about the real nature of such variables, and some groups of behavior workers refuse to use them and concentrate entirely on directly observable aspects of behavior. However, most people who have worked with animals under fairly natural conditions recognize the necessity to invoke intervening variables in behavior. . . .

"...Changes in 'motivation' are deduced when we can eliminate the other factors just listed, but still observe that an animal spontaneously changes its behavior or shows a changed threshold to particular types of stimuli." (Manning 1967)

"...The very same stimulus that releases a maximal reaction at one time may have no effect at all or may elicit a weak response at another time. This variation of threshold could be due to either (1) a variation of the intensity of another external stimulus not controlled in the experiment, or (2) a variation of the intensity of internal factors, or (3) both." (Tinbergen 1951)

When indeterminacy appears

Much of the actual nuts and bolts of science is the search for satisfactory components, behavioral features, and state variables for the systems under consideration, and there are no short cuts. The task is to find some measurable aspect of the object which, acting together with the stimulus, fixes the response. The clue is to note when indeterminacy appears, since that is a sign that the state variable is inadequate.

Example: feeding behavior of damselfly larvae

An example from the study of feeding behavior is provided by the work of Johnson et al. (1975). Holling's (1966) original analysis of feeding behavior had used *hunger*, measured by the fraction of the gut which was empty, as a state variable (i.e., the feeding response is determined by the food presented and hunger).

Johnson et al. were studying the feeding behavior of damselfly larvae. This organism usually kills prey (small aquatic invertebrates) and eats them, but it will sometimes repeatedly kill and discard potential prey without eating them, a behavior known as "wasteful killing." Experiments showed that knowing the amount of food in the gut did not render this behavior predictable. Predators with the same level of "hunger" sometimes behaved one way, sometimes the other.

The explanation was found on closer examination of the damselfly gut, which is divided into a foregut and hindgut. It turns out that the contents of the hindgut determine the attack response, while the contents of the foregut determine the eating response. Wasteful killing was exhibited by individuals whose hindguts happened to be empty (saying "kill") but whose foreguts were full (saying "don't eat").

As a result of these experiments, it is clear that the state variable for this predator must include not one but two sorts of "hunger," one related to each part of the gut. This, on a small scale, is the way in which information on state variables accumulates.

Predicting the state at t+1

Given that we have constructed a state variable and a stimulus-state-response function $G(\ )$ at time t, what happens at time $t+1$? Do we need to repeat the whole process all over again? No. The trick is that we know (in $X(t)$) everything relevant about the stimulus history at time t. Between t and $t+1$ the new stimulus $e(t+1)$ is "tacked onto" the stimulus history at time t. Thus it is not unreasonable that we should be able to calculate $X(t+1)$ (i.e., everything relevant about stimulus history $e(t_0,t+1)$ from the knowledge of $X(t)$ and $e(t+1)$.

Example: hunger

Put another way, if we know your level of hunger at breakfast and the food presented to you between breakfast and lunch we should be able to predict your level of hunger at lunch. In fact, the ability to do so is defined as one of the criteria for a successful state variable.

State space model

When we combine this new prediction with the response equation, the result is a *state-space model* consisting of not one but two equations:

$$X(t+1) = F(X(t),e(t)).$$

$$r(t) = G(X(t),e(t)).$$

State and response equations

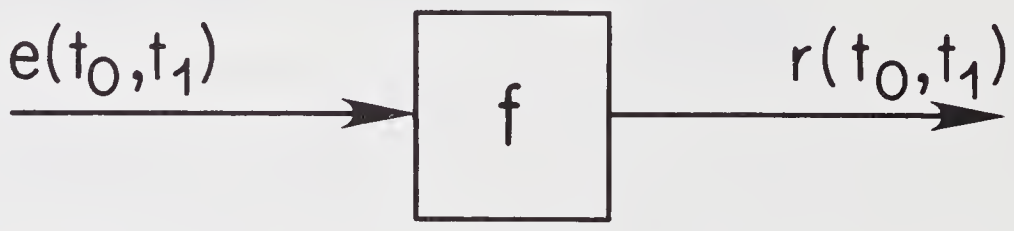
The first of these equations is called the *state equation*; it predicts the new state as a function of the current state and the stimulus. The second equation is the *response equation*; together they completely determine the dynamics of the object. The state equation is often written in a different form, by letting the time interval *(t,t+1)* become shorter and shorter. In the limit, the state equation becomes a differential rather than a difference equation, and is written:

$$\frac{dX}{dt} = F(X(t),e(t)).$$

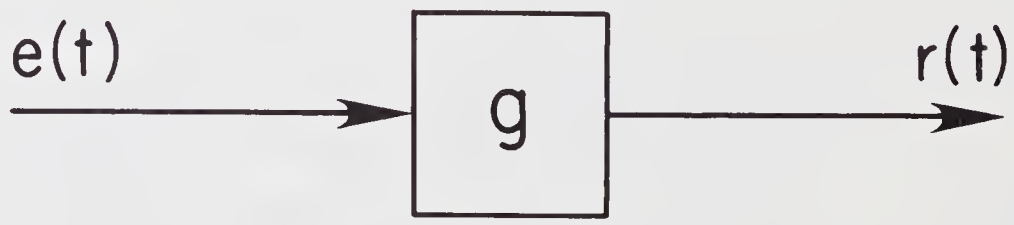
It was to analyze equations of this sort that Newton had to develop the calculus. Although the differential and difference forms of the state equation have some different mathematical properties, their general behaviors are similar enough to be equated in this paper.

Loop appears

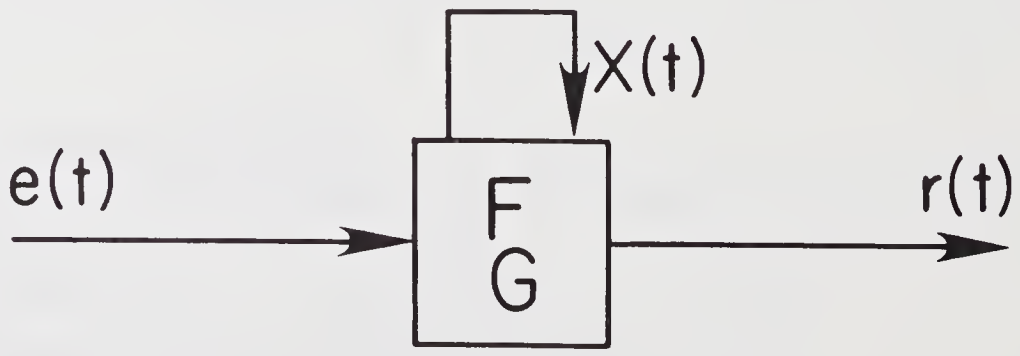
Given a sequence of stimuli, *e(t)*, these equations project the response sequence on an instant by instant basis, thereby solving the problem of time series. This solution is of more than mere convenience; it has profound implications. Consider the causal diagrams for object behavior. Based on time series, we have a determinate stimulus-response relation:



The attempt to construct a similar diagram on the basis of instantaneous acts failed:



because such models are in general not determinate. Now we have something that could be diagramed as:



The state variable *X(t)* responds to the excitation *e(t)*, but it also helps determine the response *r(t)*. Thus *X(t)* appears as a loop — there is a cycle of causation within the behavior of the object (in contrast to the earlier example, which was a cycle created by connecting several objects in a feedback loop). This cycle is intimately connected with the dynamics of the system, because the state variable is precisely the part of the description which carries the process forward in time.

State Models and Trialectic Analysis

Correspondence of trialectic and system elements

We now turn to the connection with trialectic analysis. My claim is that the state-space modeling paradigm outlined above is closely parallel to, if not identical with, trialectic analysis. The first thing to note is that a state-space model describes behavior in terms of four elements: the excitation or stimulus, the state, the response, and the function *G( )* relating the response to the excitation and state. These correspond exactly to the four elements in trialectic analysis:

attractive = excitation *(e(t))*
active = state *(X(t))*
function = response function *G(e(t), X(t))*
result = response *(r(t))*.

Attractive = stimulus; active = state

In trialectic analysis, the attractive element is "passive" while the active element is susceptible to the attractive element. These roles are certainly taken by the stimulus and state, respectively. The stimulus is passive in the sense that it arises externally, not from within the object under investigation. It corresponds to the attractive element in the sense that the stimulus is that which "attracts the attention" of the object. The value of the state variable determines whether the object is susceptible to this stimulus, and what sort of action results.

Function corresponds to G( )

The function (or equilibrium) in trialectics summarizes "all of the inter-relations between the attractive and active elements" — precisely what is contained in the response function *G(X(t),e(t))*. Moreover, the function in trialectics is often described by Ichazo as being internal, neutral, unchanged by but inseparable from the process. This is true of the function *G( )* in a very real sense; it describes the relations within the process regardless of the particular values of *e(t)* and *X(t)* in any particular manifestation of the process.

Result = response

Finally, the result of the interaction of the active and attractive elements within the laws expressed by the function *G( )* is clearly the response, *r(t)*.

Law of circulation

Beyond this simple identification, we also find the action of the law of circulation, as described in the example of food and hunger cited in the opening section. The state equation

$$X(t+1) = F(X(t), e(t)).$$

shows how the attractive element at time *t (e(t))* helps determine the active at time *t+1 (X(t+1))*. Thus the stimulus of food presented to a hungry animal transforms that animal into a new active element: a satiated animal, which may respond very differently to its environment.

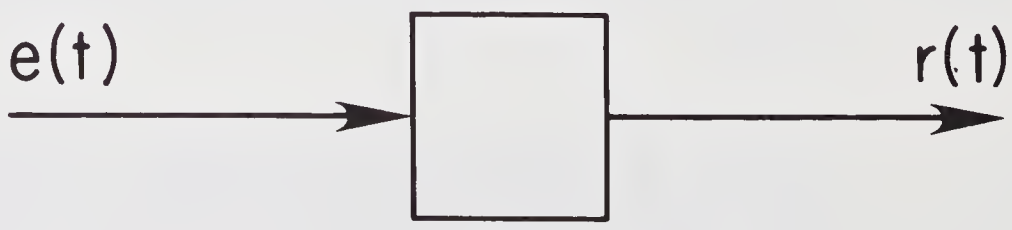
Implications: careful analysis of active and attractive

It appears that systems theorists, in their attempt to understand the dynamics of process, have converged on trialectics as a modeling paradigm. To the extent that this is so, we should look closely at the methods of system theory in an attempt to refine the process of trialectic analysis, particularly the identification of the active and attractive elements.

Moreover, since the state is a reflection of the history of the object, this invites an explicit consideration of the effects of the past in the determination of present behavior. On the personal level, for example, this would replace the casual identification of some situation as "attractive" with the question, "What is it about my experience that is determining my action in response to this attraction?"

Insight into "force" metaphors

What are the consequences of ignoring the role of the state variables in understanding process, using instead the stimulus-response framework:



Forcing our descriptions of dynamics into this framework leads first of all to a tendency to view behavior as determined from the outside, rather than as an interaction of inside and outside, and to see the response as forced, or pushed, by the stimulus (i.e., the use of energetic rather than informational metaphors).

Insight into "force" metaphors (continued)

It obscures the importance of the past in molding behavior, with the consequent notion that any outcome at all can be achieved by the use of sufficient force.

These tendencies are aspects of the dialectic paradigm, and suggest that state theory is in fact a step beyond that paradigm.

Clarifies definition of MMP

The state-space approach leads naturally to a definition and clarification of the notion of material manifestation point (MMP) (Ichazo 1976, 1982, see also Horn 1983). Ichazo uses this terminology to encompass not only material objects (the "things" of everyday discourse) but any identifiable and relatively unchanging aspect of any process. That is, mental states such as depression, or economic patterns such as the distribution of income also qualify as MMPs.

In system theory, MMPs appear as invariant states or invariant sets of states, which are capable of maintaining themselves. Mathematicians refer to these states as equilibria, limit sets, or attractors. They can be found by examining the state equation to find the particular states X^* satisfying

$$X^* = F(X^*, e(t)).$$

In the example of the steam engine governor (Figure 2) such stable modes of behavior include single states (Figure 3 a,b) or cycles of states (Figure 3c).

In the particular case of chemical or hydrodynamic systems these invariant sets of states are referred to as "dissipative structures" and are presently the object of intense study by physicists and mathematicians (e.g., Prigogine 1980).

Interactions and the Behavior of Whole Systems

Interactions: active and attractive

The discussion so far has focused on the behavior of single objects. To obtain a model of an entire system, one must also describe the pattern of interaction among the objects and combine that information with the object models (Caswell et al. 1972).

Interactions: active and attractive (continued)

To get an idea of what this involves, consider the deer, the tiger, and their interaction. Considering the tiger as an object, the prey (deer) is attractive and the state (hungry) of the tiger is active; the function describes pursuit and the result is an attack.

But considering the deer as an object, the tiger is attractive, the state of the deer (alert, say) is active; the function describes evasion and the result is flight. When these two objects interact with each other, the response of one becomes the stimulus (attractive) for the other.

The response of the system as a whole depends on the laws governing the two objects and on their interaction. It will be very different if the deer responds to the presence of the tiger by freezing instead of running, because the tiger responds differently to a running prey than a stationary one.

Example: Sufi story

"Walking one evening along a deserted road, Mulla Nasrudin saw a troop of horsemen coming towards him.

His imagination started to work; he saw himself captured and sold as a slave, or impressed into the army.

Nasrudin bolted, climbed a wall into a graveyard, and lay down in an open tomb.

Puzzled at his strange behaviour, the men — honest travellers —followed him.

They found him stretched out, tense and quivering.

'What are you doing in that grave? We saw you run away. Can we help you?'

'Just because you can ask a question does not mean that there is a straightforward answer to it,' said the Mulla, who now realized what had happened. 'It all depends upon your viewpoint. If you must know, however; I am here because of *you*, and *you* are here because of me.'" (Shah 1972)

Interactions and the Behavior of Whole Systems, Continued

Description of whole systems: parts and interactions

Complex systems, then, are networks of interacting trialectic processes. The resulting patterns of behavior are not predictable from a study of the components in isolation; this is the operational meaning of the old saying, "The whole is more than the sum of its parts." Indeed, in sufficiently complex systems, the pattern of interaction may be much more important than the nature of the objects in determining whole system behavior (e.g., consider the different systems that a good electronics engineer can assemble from the same set of electrical components, varying only the interconnection patterns).

Example of Trialectic Analysis: Physical Process of Combustion

Distinction between variables and specific values

I will close this paper with two examples of trialectic analysis, attempting to apply the insights obtained from our consideration of cybernetics. Each example raises points that need further study. I have chosen one physical process and one biological process.

"In the example of burning paper, fire is the active, paper is the attractive, burning is the equilibrium and ashes are the result. The laws which govern combustion are neutral, but the burning itself is an esential part of the process." (One United System 1982) This example highlights an important problem: the failure to distinguish between *variables*, which may range over some set of possibilities, and the particular *values* assumed by those variables in a *particular* situation. Anyone who has lived with a wood stove or a fireplace knows that not every interaction of fire and paper follows the pattern just described. If the paper is damp or the fire too small or the draft insufficient, the result can be an extinguished fire. If wood (dry or green), gasoline, charcoal, etc. is substituted for paper, there are other possible outcomes, ranging from an extinguished fire to a destructive explosion. Presumably, the laws that govern combustion are responsible for determining which of these outcomes occurs, and are invariant, operating in every one of these cases.

Example of Trialectic Analysis: Physical Process of Combustion, Continued

More detailed analysis

I would rephrase the example as follows. The *fuel* is attractive. Fuel here is a variable; some of the possible values it can assume include dry paper, wet paper, dry wood, gasoline, coal, and so on. The *state of the fire* is active.

This state is a variable; a particular value of this variable would specify such things as the temperature of the fire and the oxygen supply. The interaction of the fuel and the state of the fire produces a *result* which is also a variable (ashes, smoke, explosion, coals, etc.) and a *new state* of the fire (hotter or cooler, more vigorous or less than it was before).

The neutral laws of combustion determine both the result and the new state, and are without doubt an "essential part of the process." In fact, viewed from this perspective, these laws are even more important than they were before, because they have much more to do. Instead of saying that when you burn paper you get ashes, these laws have to specify *which* of a large number of possible results are obtained from each of a large number of combinations of attractive elements and active states.

Example of Trialectic Analysis: The Electron Transport System

Living systems use energy

This example shows the importance of recognizing interaction as the means by which complex systems are integrated and the possibility of using that integration to examine systems at different hierarchical levels.

Living systems require energy to maintain their structure and function. The ultimate source of this energy is the sun. Plants trap solar energy in photosynthesis, using it to produce reduced carbon compounds (carbohydrates).

When animals eat these compounds, they oxidize them, removing high energy electrons which are eventually used to reduce oxygen to water. This process releases energy, which is used to power the animal.

ATP: metabolic common currency

A supply of energy, however, is not sufficient. The organisms must be able to use the energy in a wide variety of different metabolic activities. To do so, they have adopted a single energy-carrying molecule which serves as a sort of metabolic common currency. The molecule is adenosine triphosphate (ATP).

Example of Trialectic Analysis: The Electron Transport System, Continued

Oxidation produces ATP

The last of the three phosphate groups on ATP is held with a high energy bond. When that phosphate is removed, producing adenosine diphosphate (ADP) and a free phosphate group (P_i), the energy of that bond is released and available to do metabolic work.

The immediate goal of the oxidation of food is to produce ATP from the ADP and P_i. The ATP can then be used in metabolic processes throughout the body.

Electron transport system: definition

An important part of the metabolism of aerobic organisms is the *electron transport system* (Figure 4). The procedure involved is typical of metabolic systems.

The electron transport system is a chain of seven compounds, each of which exists in two discrete states (MMPs). The compounds jump between these states by gaining or losing electrons. As electrons are passed from one of these compounds to the next, energy is released. At three places along the chain, the energy is used to produce ATP from ADP and P_i.

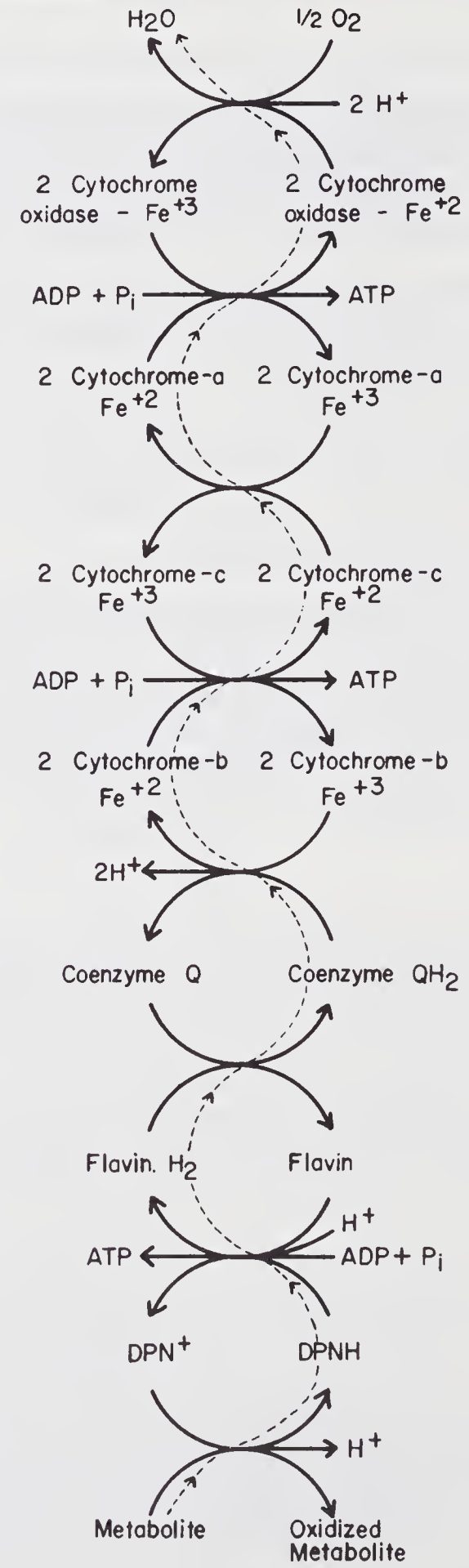
Trialectic analysis of Step 1

Consider the first step in the chain (Figure 4, bottom). The reduced metabolite (the product of an earlier food breakdown process called glycolysis) is attractive, while DPN (diphosphopyridine nucleotide, also called nicotinamide adenine dinucleotide, NAD) in its oxidized state is active. The function is a subset of the laws of chemistry governing oxidation - reduction reactions. The result is the oxidation of the metabolite and the transfer of an electron to DPN, changing it to the reduced state, denoted DPNH.

Trialectic analysis of Step 2

DPNH, together with ADP and phosphate, now becomes attractive. The next compound in the chain, oxidized flavin, becomes active, and the result is the transfer of an electron to flavin, the production of ATP, and the return of DPNH to its oxidized state (DPN), ready for use again. Flavin has jumped from the oxidized to the reduced state, and becomes attractive to Coenzyme Q in its oxidized state. The process continues through the entire chain, which is structured so that the active element of each component provides the attractive element for the next.

Figure 4.
The Electron Transport System



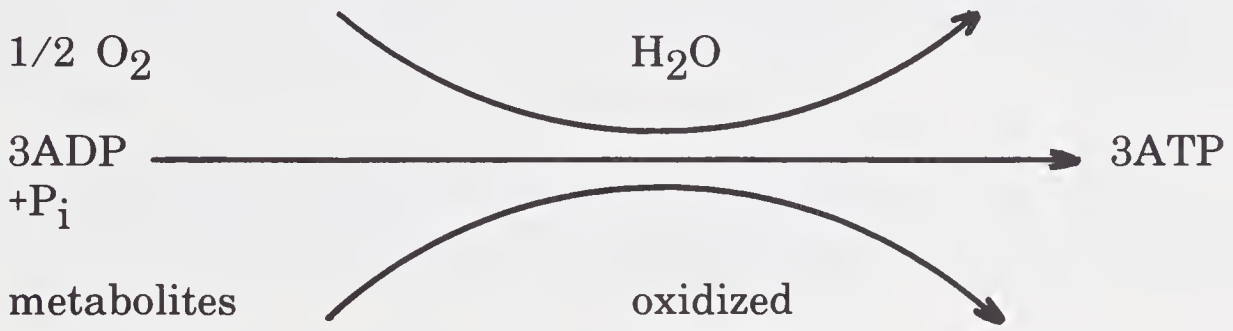
Example of Trialectic Analysis: The Electron Transport System, Continued

Every link cycles back

Notice that this chain of interacting trialectic processes is structured so that every compound save the first and the last (I'll return to those in a minute) cycles back to its original state. The system would not work otherwise, since the supply of any one compound would quickly be exhausted if it was not recycled. Cyanide is such a deadly poison because it blocks the last step in the electron transport chain. This inactivates cytochrome oxidase and thus the entire ATP producing process.

Higher level analysis of electron transport system

All of these interactions take place *within* the system with the exception of the first, the last, and the ATP producing steps. It is possible to collapse the whole diagram and view the system from a higher level of organization:



Higher level context for system

From this perspective we appear to have lost the cyclic nature of the system. In order to complete these cycles and maintain the system, we must consider higher levels of organization, examining the larger system in which the entire electron transport system is an interacting component. The ATP is recycled to ADP and P_i through other metabolic pathways in the body, which utilize the energy in ATP to do work.

The cycles involving the food, O_2, and H_2O are closed at an even higher level of organization: the ecological interaction between plants and animals. The oxidized metabolites eventually end up as CO_2. However, CO_2 and H_2O (the end results of animal metabolism) are used as substrates by plants in photosynthesis, producing the O_2 and reduced carbon compounds required by animals.

At the global level, the cycle is perfectly adjusted. Similar ecological cycles exist for nitrogen, sulfur, and other compounds, and they can also be followed at levels from individual metabolism up to the ecosystem (see Lovelock 1979 for a controversial but thought-provoking discussion of the regulation of these cycles).

Conclusions

Summary

Cybernetics as a discipline is concerned with process, interaction, and unity. Trialectics is a metaphysical framework (a paradigm, if that overworked word can be used again) with the same concerns.

The position of this paper is that the two approaches have converged to essentially the same point, and that each is capable of informing the activities of the other. The cybernetic approach to dynamics, especially Zadeh's theory of state and the concept of interaction between components leading to integration at the whole system level, suggests valuable refinements of trialectic analysis. The generality of trialectics as a metaphysical program promises a wide application of these ideas.

Notes

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TRIALECTICS

Toward a Practical Logic of Unity

Edited by ROBERT E. HORN

The 20th century has seen deep, fundamental changes in the way in which we view reality. Several developments have contributed to these changes. There have been profound breakthroughs since the turn of the century in the physical sciences. We face an ever more complex network of international economic, social, and environmental problems. Technological developments continue to increase the speed with which our information and problems travel around the planet.

Diverse as these developments are, they all point to the same conclusion: Our world is a unity. And the venerable tradition in the West of studying the fragments of that unity in isolation is an increasingly limited tool for understanding. We badly need perspectives which go beyond the mere acknowledgment of the unity of reality to provide effective tools for understanding that unity.

—*From Editor's Introduction*

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